WORLD OIL

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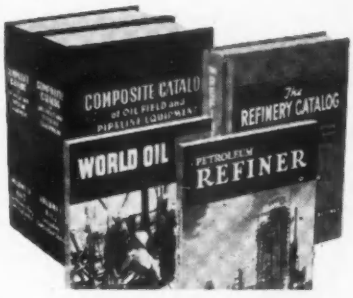

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WORLD OIL and The COMPOSITE CATALOG
for the drilling-producing-pipe line industry

PETROLEUM REFINER and The REFINERY CATALOG
for the refining-natural gasoline industry

FOREWORD . . . .

THIS INTERNATIONAL Operations Issue is the result of the months-long efforts required in gathering and compiling all available data concerning petroleum activities wherever they existed in 1951. The word "available" is used advisedly, for hand in hand with the spread of Communism and its unrelenting censorship of all but propaganda oil news went the swelling trend of restricted news releases from dictator countries. However, WORLD OIL was able to obtain at least partial coverage from these countries through its private sources.

Again this year WORLD OIL and its editors commend these private individuals, many of whom forwarded technical information at considerable personal risk. Their position in this world of upheaval is not one of raw espionage. Their sole objective is to assist in the dissemination of information which will, if presented in the proper perspective as WORLD OIL has tried to do, serve the world at large with exact, valuable reports allowing expert analysis of global oil's immediate past and future—an analysis requisite to prudent planning for all peoples.

Into this International Operations Issue also have gone the efforts of many governments, oil companies and other interested persons who spent many days compiling data.

This information has been edited and catalogued with the convenience of the reader in mind. Included are the most complete data available anywhere on daily, yearly and cumulative world production, number of oil producing wells, producing depths, formations and other data by fields: oil and gas wells and dry holes completed, footage and bottom hole results. Additional tables and charts contain information on refineries and pipe lines, their locations and capacities.

Featured in this issue is the new presentation of the largest and most detailed collection of current oil field maps on areas outside the U. S. The maps, in color, show sizes, shapes and locations of oil and gas fields, dry wildcats, pipe lines and refineries in all major oil producing areas.

The maps are presented in a style suitable for wall hanging. Maps for each continent have been grouped on three inserted pages. This affords the reader a complete fill-in on details of oil activities for any area at a glance.

But it is to the data upon which these maps and the articles included in this issue are based that WORLD OIL extends its sincere appreciation to its correspondents and friends throughout the world for their stellar roles in helping prepare a current information and reference issue unparalleled on the current oil scene.

The Editors

Why REED TWIN-BLAST ROCK BITS *remove cuttings faster*

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OIL IN 1951

Industry Meets Extraordinary Demands with Unified Efforts Resulting in Production, Refining Gains

EVEN 1950's petroleum industry marks fell by the wayside as the oil business in 1951 produced more oil and more records. Ever-increasing demand and stockpiling offset monetary and political "soft" spots by a margin sufficiently wide to allow these sizable new records. Behind the "more new records" petroleum report for 1951 were unified efforts throughout a major portion of the world's crude-producing areas which resulted in production, transportation and refining increases.

By these efforts the petroleum industry greatly improved its position. Higher went the figures for total footage, well completions, wells drilling at the close of the year, number of refineries in operation, daily crude runs to stills, and reserves.

Reserves, around which hovers the future of the oil industry, experienced further growth in 1951 by more than 5¼ billion barrels. As a result, reserves as of January 1, 1952, had grown a total of more than 24 billion barrels from 1946. Canada, which figures heavily in all increases chalked up by the world during the year, helped shove the reserve total upward with an increase in estimated proven reserves of almost 1½ billion barrels since 1946.

As of January 1, 1952, the world had a ratio of reserves to annual production of 23½ years. In 1950, the ratio was 25.2 years. So the industry is facing the problem of diminishing reserves. But again in 1951 the oil industry faced the problem squarely. Drilling operations were stepped up. Well completions rose 688 from the 1950 record. Footage, the best yardstick for drilling activity and comparison, climbed 14,644,945 feet from record heights the previous year—an 8½ percent rise. The continuing search for new oil was reflected by the 5542 wells which were drilling at year's end, up 601 from the previous year.

Soaring production underscored further need for discovering new oil. A record of 4,277,320,000 barrels topped output for the previous year by 13 percent. With this tremendous production, total world excess supply of crude and products over demand during the year amounted to only 250,900 barrels daily. In 1948, the excess supply over demand reached 493,100 barrels per day.

During the year, a marked increase toward home refining largely affected the world trade movement of crude as compared with refined products. Europe alone, which entered the home refining trend wholeheartedly, reported the operation of a dozen more refineries than were operated during 1950. Daily crude runs to stills climbed from 930,357 barrels to 1,343,484 barrels.

Over-all conditions in 1951 forced a continuing pressure on the oil industry—the same pressure under which the business has been operating for years. This strain remained despite restoration and expansion programs which progressed vigorously during 1951 and which were designed to meet the extraordinary demands placed upon it.

The U. S., with domestic crude and oil products supply of 6,713,100 barrels a day, failed by 318,600 barrels daily of meeting the national requirements. However, 1951 excess demand over supply of that figure was 272,100 barrels per day less than during the previous year, when excess demand rose to 590,700 barrels daily.

Only two areas, the Caribbean and the Middle East, reported excess supply over demand. That condition has existed since 1949. In 1948, the U. S. reported an excess supply of oil and crude products over demand of 146,400 barrels a day. And in 1947, the U. S. exceeded demands by a smaller margin of 2400 barrels daily. Consequently, the U. S. acquired a large percentage of its imports from Venezuela and the Middle East.

Alaska and Canada underwent a growing exploration and exploitation schedule during the year. Strategically situated for the Western world, both areas may be the source for the additional new oil required to improve the world's reserves standing.

Western Canada broke all of its existing oil and gas search and development records. Results which were not completely tabulated or evaluated at the close of the year credited the country with at least 108 new oil and gas fields. Pipe line expansion, under way and scheduled, soon will enable the Canadian industry to more fully produce existing wells.

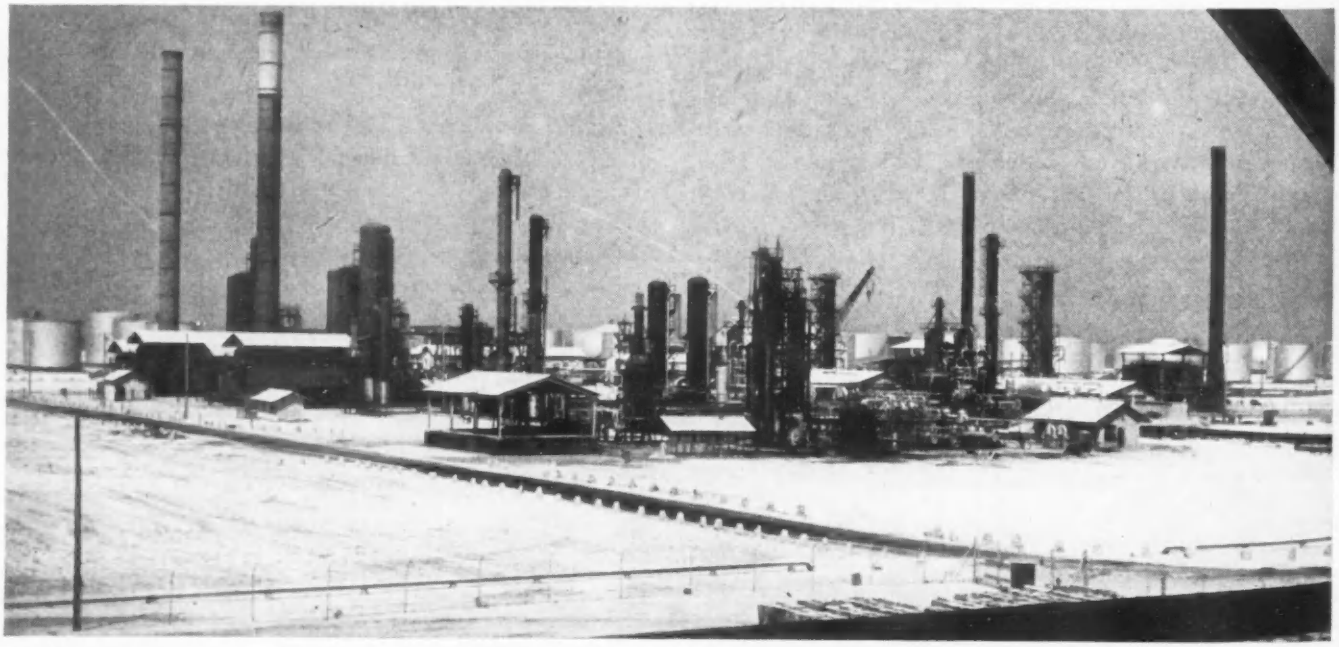
Alaska's Naval Petroleum Reserve 4 was again in 1951 the center of the U. S. Navy Department oil exploration interest. Twenty wells drilled during the year resulted in three oil and three gas shows. Of major importance was the confirmation of commercial production at Umiat.

Kuwait was yet another oil-producing country which,

Last year was one of intense activity in Alaska as the U. S. Navy Department accelerated its search for oil in Petroleum Reserve 4.

A drilling well in Mexico's Escolin field, operated by Petroleos Mexicanos.

Indonesian opens flowing well in Minas field.



The Arabian American Oil Company refinery at Ras Tanura, Saudi Arabia, handled crude runs to stills during 1951 of 151,290 barrels daily.

during the year, saw development which presaged further upward revision in both production and reserves. Late in the year, an oil well was brought in seven miles north of the vast Burgan field, which produced 205,127,466 barrels in 1951. Though rate of production of the new well was not ascertained by tests at the year's end the discovery well immediately led to the scheduling of additional extensions.

While the pay zone north of Burgan was not designated as a Burgan field extension or a new field, the horizon was found in a formation different from the sandstone source of prolific Burgan output. Consequently, no figure had been placed on the additional estimated reserves.

A second highlight in Kuwait oil activities occurred in 1951 as a new income tax-royalty agreement was signed by the Sheik of Kuwait and the Kuwait Oil Company, Ltd. The pact initiated a 50-50 sharing of profits.

Indonesia, British Borneo and The Netherlands New Guinea helped considerably in brightening the oil outlook for 1952 by their 1951 operations. While Indonesia operated at about half of capacity last year, 55,353,551 barrels of crude was produced, more than 8 million barrels greater than in the previous year. Indonesia, British Borneo and The Netherlands New Guinea—the major crude producers of the Far East—saw their operations almost completely destroyed during World War II. Indonesia's initial crude exports to the U. S. arrived early in June.

Japan, forging ahead in its effort to acquire a more satisfactory balance of oil production and requirements, in 1951 produced only 10 percent of domestic needs while increasing its output between 12 percent and 13 percent from the previous year.

The Petroleum Advisory Group, formed in 1945 to study Japan's petroleum industry, was terminated at mid-year. With its objective the reinstitution of commercial operations as quickly as possible, the PAG spent 68 months in uninterrupted service to Japan, to the Far East Command and the Supreme Commander for the Allied Powers.

Technical producing authorities conceded that Japan's domestic producing industry, even in competition with imported crude, can be assured by properly emphasizing exploration and exploitation.

Japanese refining, however, is still limited by the need for electric power. That limiting factor will preclude any immediate increase in refining operations within Japan. No increase of the nation's domestic power potential is expected without government subsidy or investment of foreign capital.

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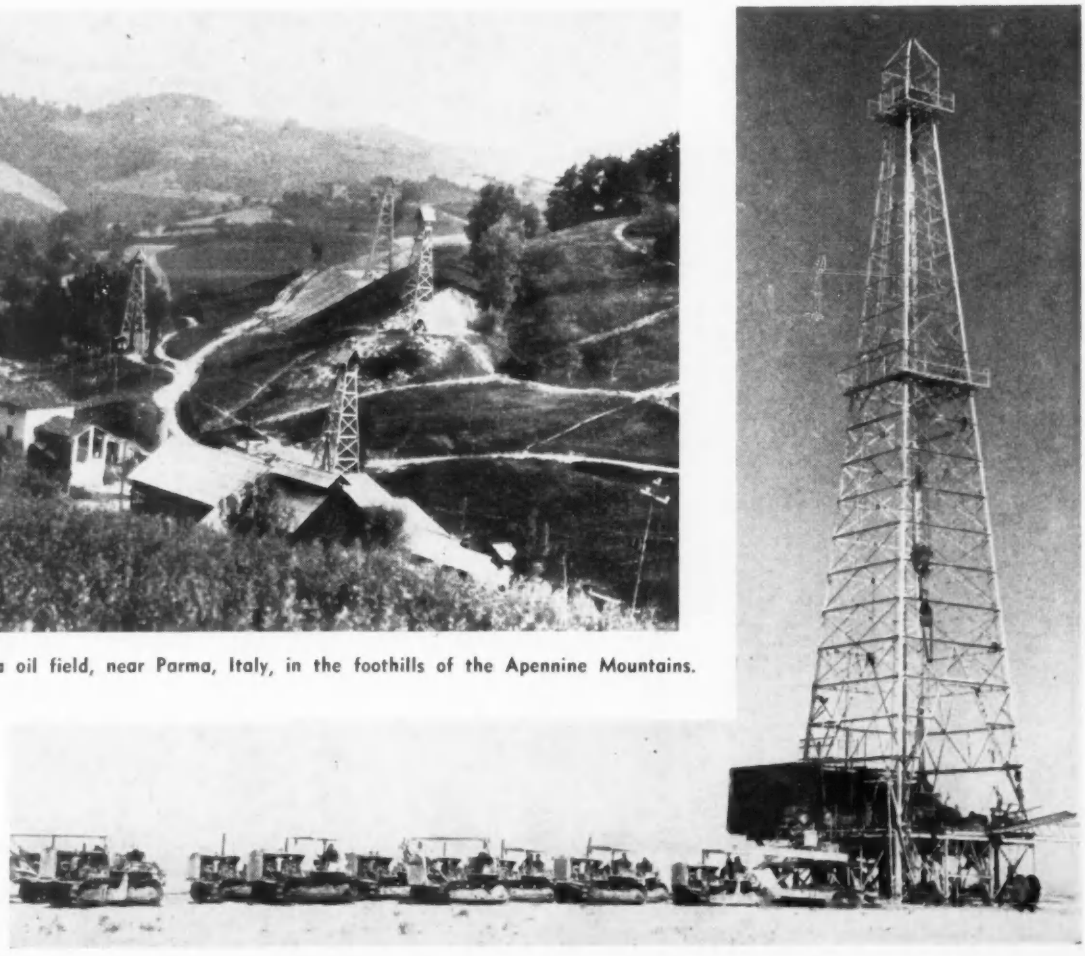
These wells are in Valleza oil field, near Parma, Italy, in the foothills of the Apennine Mountains.



A derrick is skidded to a new drilling site across the Kuwait sands.

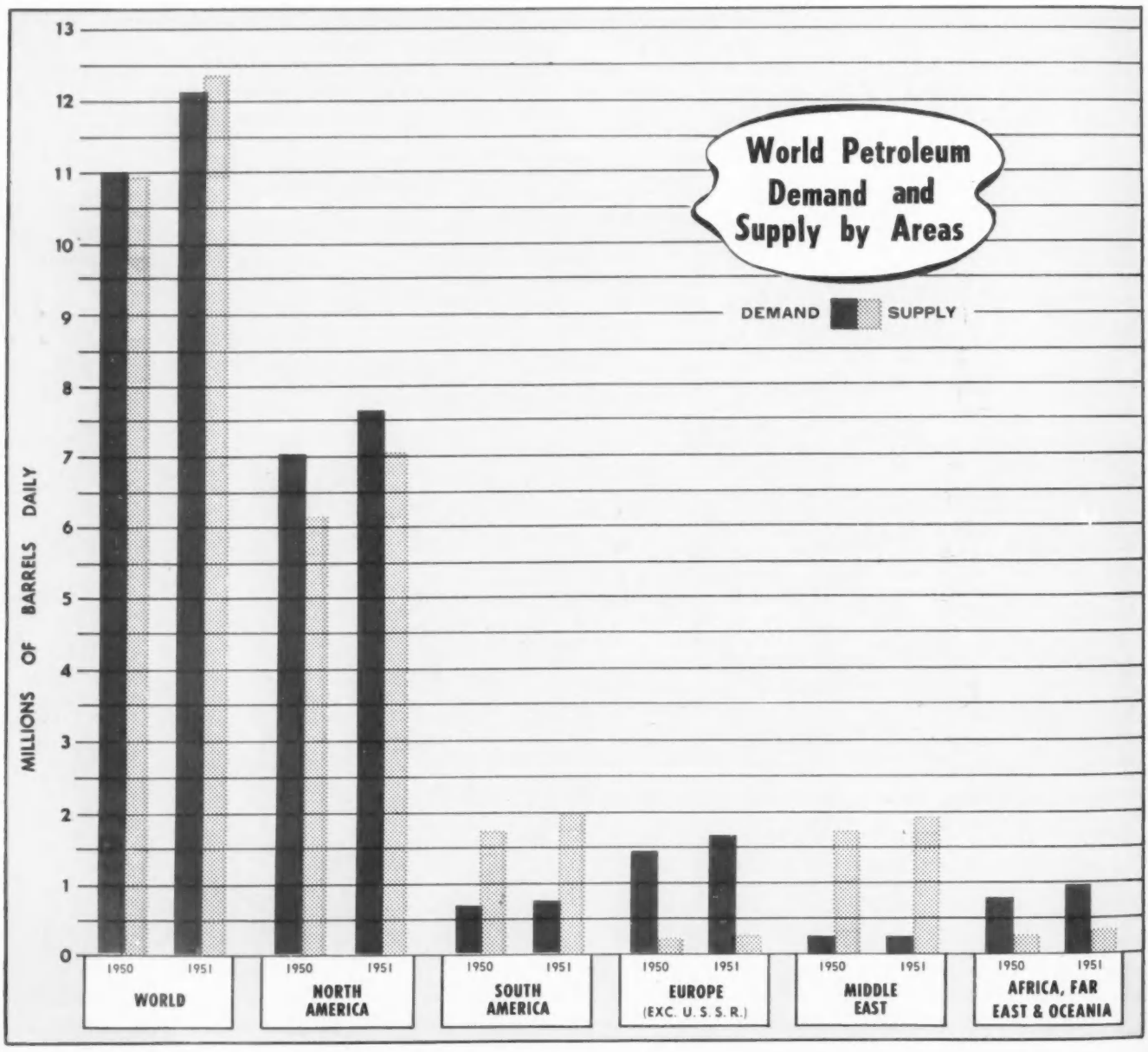
WORLD SUPPLY AND DEMAND

Both Production and Need Establish Record Gains; Loss of Iranian Output Fails to Upset Balance

WORLD supply and demand increased substantially in 1951, both establishing new records. Since the rate of gain in total supply was larger than the rise in total requirements, the loss of Iranian production, which had averaged about 661,000 barrels daily until mid-year, had no major influence on over-all world supply-demand trends other than stimulating the productive efforts of other nations.

Total demand for petroleum in 1951 increased by a daily average of 1,166,800 barrels from 1950 to 12,134,400 barrels, a rise of 10.6 percent. This compared with a gain in 1950 over 1949 of 12.5 percent, reflecting continued high industrial activity.

Western Europe's domestic demand again recorded one of the largest year-to-year gains—16.5 percent. The rate of expansion in Europe last year was a percentage point less than the 1950 rise over 1949. While part of this decline in demand growth can be attributed to temporary



disruption of supply created by the Iranian shutdown, the more important factor was the strong indications the area's postwar boom was tapering off.

With all geographical areas recording increases in domestic demand over the previous year, the total gain for the Eastern Hemisphere amounted to 15.6 percent over 1950, while the increase in the Western Hemisphere was 8.6 percent.

Combined world production again set a new peak of 12,385,300 barrels daily of crude, natural gas, liquids, and synthetic fuels, an increase of 13 percent, or 1,424,400 barrels per day over 1950. This resulted despite a 47 percent reduction of crude output in Iran, compared with 1950. It represented the largest annual expansion in production since 1944.

Excess supply over demand, averaging 250,900 barrels daily, compared with a world deficit of 6700 barrels daily in 1950. World supply in 1951 was composed of a daily average output of 11,718,700 barrels of crude and 666,600 barrels of natural gasoline and synthetics. World crude production, compared with 1950, was up 13.1 percent, while other output increased almost 12 percent.

Petroleum Demand and Supply by Areas, 1948-1949-1950-1951

Barrels Per Day

	Domestic Demand	DOMESTIC SUPPLY			Excess Supply Over Demand	Excess Demand Over Supply	PERCENT OF WORLD TOTAL	
		Crude Oil	Natural Gasoline, Etc.	Total			Domestic Demand	Domestic Supply
1951:								
United States	7,031,700	6,149,100	564,000	6,713,100	.....	318,600	57.95	54.20
Other North America	589,900	340,600	5,100	345,700	.....	244,200	4.86	2.79
Total North America	7,621,600	6,489,700	569,100	7,058,800	.....	562,800	62.81	56.99
Caribbean Area	249,300	1,865,400	8,700	1,874,100	1,624,800	.....	2.06	15.13
Other South America	507,700	124,000	5,500	129,500	.....	378,200	4.18	1.05
Total South America	757,000	1,989,400	14,200	2,003,600	1,246,600	.....	6.24	16.18
Europe (Excluding U.S.S.R.)	1,677,100	188,400	52,600	241,000	.....	1,436,100	13.82	1.95
U.S.S.R.	858,000	787,700	26,000	813,700	.....	44,300	7.07	6.57
Africa	330,000	46,500	2,000	48,500	.....	281,500	2.72	0.39
Middle East	255,700	1,924,100	.....	1,924,100	1,668,400	.....	2.11	15.53
Far East and Oceania	635,000	292,900	2,700	295,600	.....	339,400	5.23	2.39
TOTAL WORLD	12,134,400	11,718,700	666,600	12,385,300	250,900	.....	100.00	100.00
1950:								
United States	6,499,000	5,402,300	499,000	5,901,300	.....	597,700	59.25	53.84
Other North America	524,000	275,900	5,100	281,000	.....	243,000	4.78	2.56
Total North America	7,023,000	5,678,200	504,100	6,182,300	.....	840,700	64.03	56.40
Caribbean Area	225,800	1,630,000	6,100	1,636,100	1,410,300	.....	2.06	14.93
Other South America	469,200	116,900	4,800	121,700	.....	347,500	4.28	1.11
Total South America	695,000	1,746,900	10,900	1,757,800	1,062,800	.....	6.34	16.04
Europe (Excluding U.S.S.R.)	1,440,000	164,600	53,200	217,800	.....	1,222,200	13.13	1.99
U.S.S.R.	770,000	740,200	24,000	764,200	.....	5,800	7.02	6.97
Africa	276,100	45,100	1,500	46,600	.....	229,500	2.52	0.43
Middle East	250,000	1,742,900	.....	1,742,900	1,492,900	.....	2.28	15.90
Far East and Oceania	513,500	247,400	1,900	249,300	.....	264,200	4.68	2.27
TOTAL WORLD	10,967,600	10,365,300	595,600	10,960,900	.....	6,700	100.00	100.00
1949:								
United States	5,792,400	5,046,400	428,500	5,474,900	.....	317,500	59.42	54.19
Other North America	478,200	224,900	8,200	233,100	.....	245,100	4.91	2.41
Total North America	6,270,600	5,271,300	436,700	5,708,000	.....	562,600	64.33	56.60
Caribbean Area	212,900	1,459,300	4,900	1,464,200	1,251,300	.....	2.18	15.67
Other South America	397,500	113,100	5,200	118,300	.....	279,200	4.08	1.21
Total South America	610,400	1,572,400	10,100	1,582,500	972,100	.....	6.26	16.88
Europe (Excluding U.S.S.R.)	1,226,700	160,500	26,000	186,500	.....	1,040,200	12.59	1.72
U.S.S.R.	707,000	638,800	22,000	660,800	.....	46,200	7.25	6.86
Africa	236,800	43,800	1,000	44,800	.....	192,000	2.43	0.47
Middle East	211,800	1,401,300	.....	1,401,300	1,189,500	.....	2.17	15.05
Far East and Oceania	484,000	225,000	2,200	227,200	.....	256,800	4.97	2.42
TOTAL WORLD	9,747,300	9,313,100	498,000	9,811,100	63,800	.....	100.00	100.00
1948:								
United States	5,775,100	5,519,600	401,900	5,921,500	146,400	.....	61.83	58.84
Other North America	444,400	193,800	8,300	202,100	.....	242,300	4.76	2.07
Total North America	6,219,500	5,713,400	410,200	6,123,600	.....	95,900	66.59	60.91
Caribbean Area	210,600	1,458,800	3,700	1,462,500	1,251,900	.....	2.25	15.55
Other South America	390,000	112,000	4,800	116,800	.....	273,200	4.18	1.20
Total South America	600,600	1,570,800	8,500	1,579,300	978,700	.....	6.43	16.75
Europe (Excluding U.S.S.R.)	1,060,600	151,100	21,100	172,200	.....	897,400	11.45	1.61
U.S.S.R.	618,000	595,600	12,000	607,600	.....	10,400	6.62	6.35
Africa	212,500	36,900	800	37,700	.....	174,800	2.27	0.39
Middle East	182,200	1,138,700	.....	1,138,700	956,500	.....	1.95	12.14
Far East and Oceania	438,000	173,300	1,100	174,400	.....	263,600	4.69	1.85
TOTAL WORLD	9,340,400	9,379,800	453,700	9,833,500	493,100	.....	100.00	100.00

SOURCE: Demand and natural gasoline production figures from C. J. Bauer, Petroleum Economist, Standard Oil Company (New Jersey). Crude production figures by WORLD OIL.

WORLD CRUDE PRODUCTION

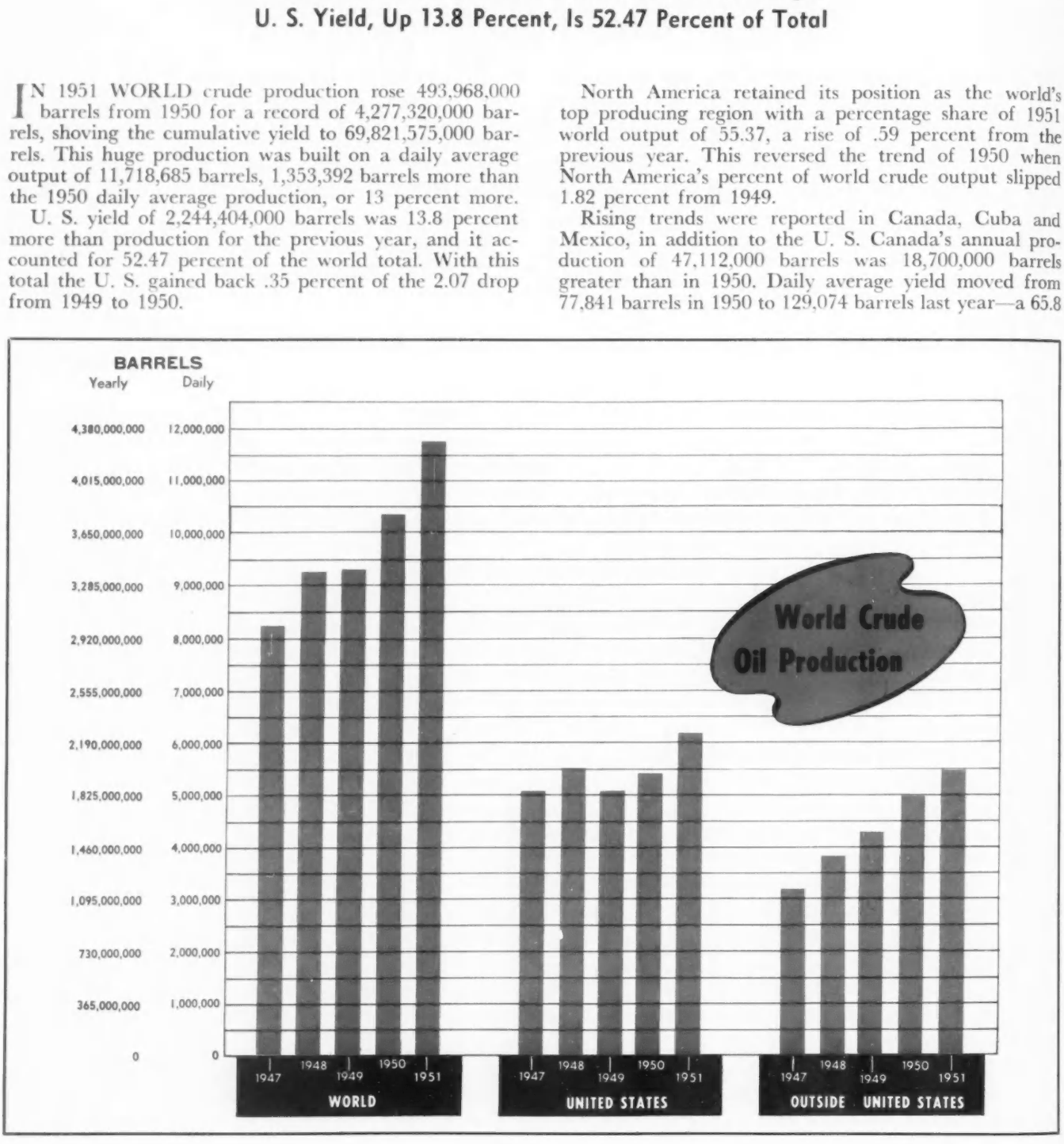
Output Rises Nearly 494 Million Barrels to New High; U. S. Yield, Up 13.8 Percent, Is 52.47 Percent of Total

IN 1951 WORLD crude production rose 493,968,000 barrels from 1950 for a record of 4,277,320,000 barrels, shoving the cumulative yield to 69,821,575,000 barrels. This huge production was built on a daily average output of 11,718,685 barrels, 1,353,392 barrels more than the 1950 daily average production, or 13 percent more.

U. S. yield of 2,244,404,000 barrels was 13.8 percent more than production for the previous year, and it accounted for 52.47 percent of the world total. With this total the U. S. gained back .35 percent of the 2.07 drop from 1949 to 1950.

North America retained its position as the world's top producing region with a percentage share of 1951 world output of 55.37, a rise of .59 percent from the previous year. This reversed the trend of 1950 when North America's percent of world crude output slipped 1.82 percent from 1949.

Rising trends were reported in Canada, Cuba and Mexico, in addition to the U. S. Canada's annual production of 47,112,000 barrels was 18,700,000 barrels greater than in 1950. Daily average yield moved from 77,841 barrels in 1950 to 129,074 barrels last year—a 65.8



(All Figures in Barrels)

YEAR	WORLD		UNITED STATES		OUTSIDE U.S.A.		YEAR	WORLD		UNITED STATES		OUTSIDE U.S.A.	
	Annual Total	Daily Average	Annual Total	Daily Average	Annual Total	Daily Average		Annual Total	Daily Average	Annual Total	Daily Average	Annual Total	Daily Average
1938....	1,988,041,000	5,466,000	1,214,355,000	3,327,000	773,686,000	2,119,000	1945....	2,594,798,000	7,109,000	1,713,655,000	4,694,900	881,143,000	2,414,100
1939....	2,086,160,000	5,715,500	1,264,962,000	3,465,000	821,198,000	2,249,900	1946....	2,745,474,000	7,521,800	1,733,939,000	4,750,500	1,011,525,000	2,771,300
1940....	2,149,821,000	5,873,800	1,353,214,000	3,367,300	796,607,000	2,176,500	1947....	3,022,075,000	8,279,700	1,856,987,000	5,087,600	1,165,088,000	3,192,100
1941....	2,220,657,000	6,084,000	1,402,228,000	3,841,700	818,429,000	2,242,300	1948....	3,433,021,000	9,405,500	2,020,185,000	5,519,600	1,412,836,000	3,885,900
1942....	2,093,100,000	5,734,500	1,386,645,000	3,799,000	706,455,000	1,935,500	1949....	3,399,290,000	9,313,100	1,841,940,000	5,046,400	1,557,350,000	4,266,700
1943....	2,256,637,000	6,182,600	1,505,613,000	4,125,000	751,034,000	2,057,600	1950....	3,783,332,000	10,365,300	1,971,845,000	5,402,300	1,811,487,000	4,963,000
1944....	2,592,371,000	7,102,400	1,677,904,000	4,584,400	914,467,000	2,518,000	1951....	4,277,300,000	11,718,700	2,244,404,000	6,149,100	2,032,896,000	5,569,600

percent increase. And Canada's share of total world production for the year was 1.1 percent, up .35 percent from the previous year.

Mexico, with 1951 daily average production of 211,203 barrels, chalked up a 6.9 percent rise from 1950, and gained for itself a 1.8 percent share of the world total. However, Mexico's share the previous year was 1.91 percent. In 1951, Cuba produced 118,000 barrels; in 1950, 156,000 barrels.

Emphasis was drawn during 1951 to the Middle East and the loss of Iran's production to world trade channels. Despite that loss, which amounted to 112,922,000 barrels during the year, or 309,375 barrels daily, the Middle East share of the year world's annual output slipped only ¼ percent from 16.82 percent in 1950. And to further show that the other Middle Eastern oil-producing countries could take up the slack, Bahrain, Iraq, Kuwait, Qatar and Saudi Arabia joined to produce an unprecedented 573,714,000 barrels, 179,017,000 barrels more than in 1950.

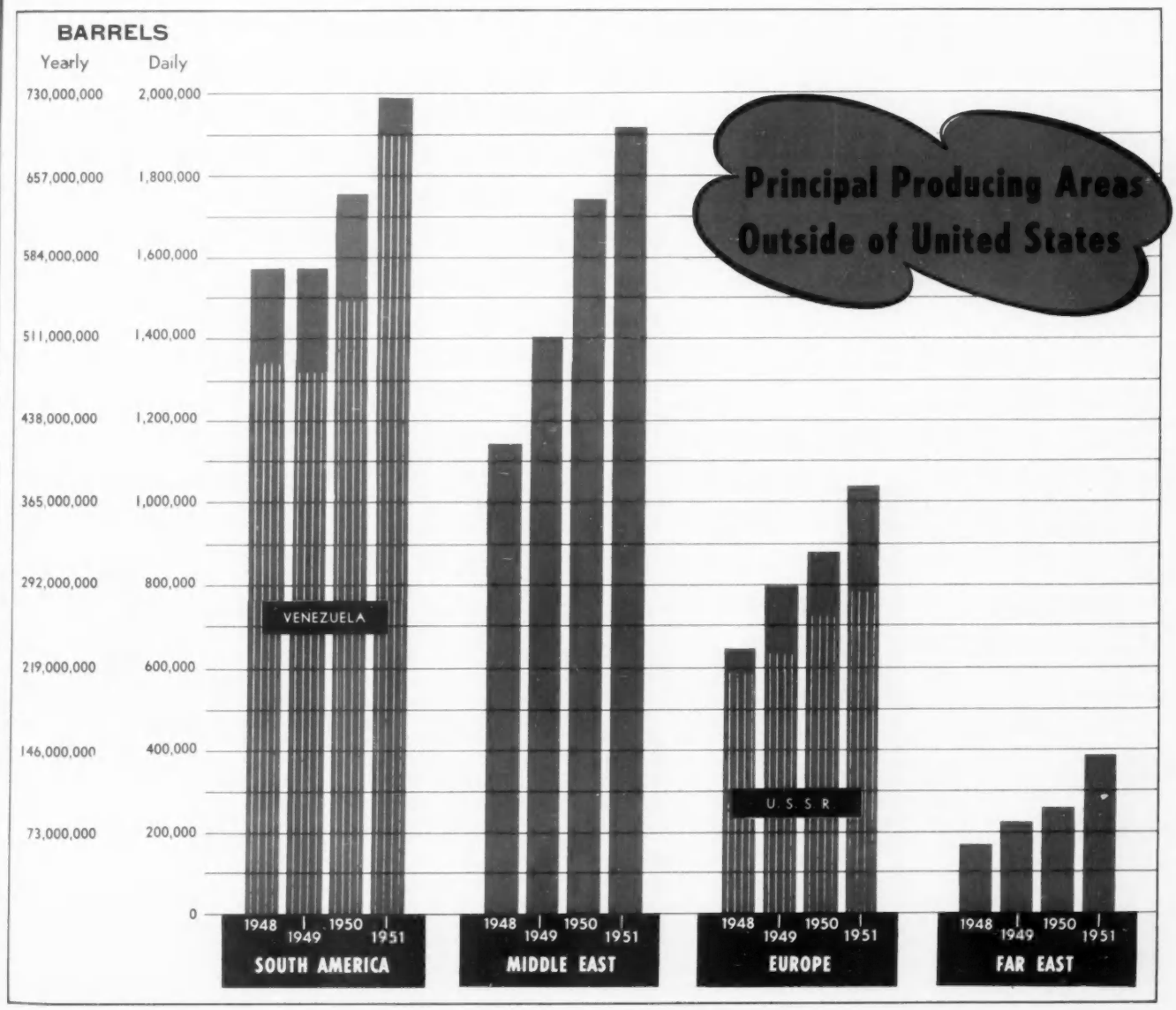
Saudi Arabian production during 1951 was 277,962,000 barrels, up 78,415 barrels from the previous year. This 39.3 percent rise was reflected in a jump of average daily production in 1950 of 546,704 barrels to 1951's 761,540 barrels. As a result, Saudi Arabia's share of the year's total amounted to 6.5 percent, as compared to 5.28 percent for the previous year.

Kuwait, the No. 2 Middle East producer in 1951, reported a 63.2 percent increase in its daily average production—from 344,981 barrels in 1950 to 561,992 barrels last year. That rate of yield enabled the sheikdom to gain itself a 4.8 percent share in the total world production figure, up from 3.33 percent the previous year.

Iraq's annual output jumped 14,774,000 barrels in 1951 from the year before with daily average production of 168,586 barrels. This 31.6 percent rise allowed Iraq to be credited with a 1.44 percent share in 1951 total world output.

While Qatar's 1951 production of 18,097,000 barrels was relatively small for the Middle East, it amounted to .42 percent of the world total. Daily average crude output of 49,581 barrels reflected a 58 percent rise from the previous year. Bahrain production decreased 21,000 barrels in 1951 from the previous year, but the island's daily average production of 30,121 barrels amounted to .26 percent of the world total for the year.

Total African output of 16,959,000 barrels last year reflected a 3 percent increase from the previous year and was tantamount to .40 percent of the world production. Egypt, major African oil producer, yielded



16,299,000 barrels in 1951, up 188,000 barrels from 1950; Morocco produced 559,000 barrels for the year, up 264,000 barrels from 1950 and Algeria produced 101,000 barrels, up 49,000 barrels from the previous year.

Venezuela remained South America's top crude producer during 1951 by a wide margin. And, in doing so, the country gained a 14.55 percent share of total world production for the year. Venezuela produced 622,187,000 barrels of oil in 1951, up 73,844,000 barrels from 1950. Daily average production equaled 1,704,622 barrels, 13.5 percent more than the previous year.

Colombia retained its No. 2 position among South American producers during the year with production of 38,148,000 barrels, or a 104,516-barrel daily average yield—up 44.9 percent from 1950. And Colombia's share of the world's output for 1951 gained .2 percent to .89 percent. Argentina, with 1951 annual production of 24,407,000 barrels, lost .05 percent of its share in total world output by dropping to .57 percent.

With a 1.1 percent increase in daily average crude production, Trinidad produced 20,532,000 barrels. That amounted to .48 percent of world output for the year—down .05 percent from the previous year.

Europe continued its rising trend by producing 356,268,000 barrels of crude during 1951, up 26,012,000 barrels from 1950. The continent's share of total world production amounted to 8.33 percent for the year, a drop of .4 percent from 1950. Most of this production was credited to U.S.S.R., excluding Sakhalin. Russian output rose almost 17½ million barrels from 1950 as a result of a 6.4 percent hike in daily average production—from 740,173 barrels in 1950 to 787,671 barrels last year.

Increasing yields benefiting the Iron Curtain also were reported in 1951 from Czechoslovakia, with a 25 percent rise; Hungary, with a 30.1 percent increase; Poland, with a jump of 7.7 percent.

Great Britain, which recorded a .6 percent gain in average daily production from 1949 to 1950, lost that gain and more as the daily average fell to 918 barrels, a 1.5 percent decrease from 1950.

France, Western Germany and The Netherlands accounted for a total percentage gain from 1950 in daily average production of 159.3. In terms of oil, this percentage rise was equal to 2,952,000 barrels.

Trends in World Crude Oil Production, by Countries, and Cumulative Production Through 1951

CONTINENT and COUNTRY	ANNUAL PRODUCTION (Thousands of Barrels)		DAILY AVERAGE PRODUCTION (Actual Barrels)			YEAR'S PRODUCTION As Percent of World		CUMULATIVE PRODUCTION TO JANUARY 1, 1951 (Thousands of Barrels)	
	1950	1951	1950	1951	% Diff. '50-'51	1950	1951	Total	As % of World
North America	**2,072,530**	**2,368,723**	**5,678,164**	**6,489,652**	**+ 14.3**	**54.78**	**55.37**	**45,961,238**	**65.83**
Canada	28,412	47,112	77,841	129,074	+ 65.8	0.75	1.10	237,959	0.34
Cuba	156	118	427	323	+ 75.6	.....	.....	2,399	.....
Mexico	72,117	77,089	197,581	211,203	+ 6.9	1.91	1.80	2,559,117	3.67
United States	1,971,845	2,244,404	5,402,315	6,149,052	+ 13.8	52.12	52.47	43,161,763	61.82
South America	**637,628**	**726,127**	**1,746,926**	**1,989,389**	**+ 13.9**	**16.85**	**16.98**	**8,104,449**	**11.61**
Argentina	23,361	24,407	64,002	66,868	+ 4.5	0.62	0.57	482,585	0.69
Barbadoes	.....	.....	.....	.....	.....	.....	.....	8	.....
Bolivia	616	514	1,688	1,408	— 16.6	0.02	0.01	6,101	0.01
Brazil	339	756	929	2,072	+123.0	0.01	0.02	1,735	.....
Chile	630	759	1,726	2,079	+ 20.5	0.02	0.02	1,389	.....
Colombia	26,323	38,148	72,117	104,516	+ 44.9	0.69	0.89	535,426	0.78
Ecuador	2,690	2,715	7,370	7,438	+ 0.9	0.07	0.06	51,803	0.07
Peru	15,027	16,109	41,170	44,134	+ 7.2	0.40	0.38	417,614	0.60
Trinidad	20,299	20,532	55,614	56,252	+ 1.1	0.53	0.48	433,296	0.62
Venezuela	548,343	622,187	1,502,310	1,704,622	+ 13.5	14.49	14.55	6,174,493	8.84
Europe	**330,246**	**356,268**	**904,784**	**976,077**	**+ 7.9**	**8.73**	**8.33**	**8,743,633**	**12.52**
Albania	2,101	2,401	5,756	6,578	+ 14.3	0.06	0.06	19,864	0.03
Austria	6,150	15,010	16,849	41,123	+144.1	0.16	0.35	79,081	0.11
Czechoslovakia	280	350	767	959	+ 25.0	0.01	0.01	5,063	0.01
France	893	2,117	2,447	5,800	+137.0	0.02	0.05	17,414	0.02
Germany	7,904	9,566	21,655	26,208	+ 21.0	0.21	0.22	116,217	0.17
Great Britain	340	335	932	918	— 1.5	0.01	0.01	5,145	0.01
Hungary	3,460	4,500	9,479	12,329	+ 30.1	0.09	0.11	54,024	0.08
Italy	72	72	197	198	+ 0.5	.....	.....	3,635	0.01
Netherlands	4,898	4,964	13,419	13,600	+ 1.3	0.13	0.12	19,586	0.03
Poland	1,205	1,298	3,302	3,556	+ 7.7	0.03	0.03	281,196	0.40
Roumania	32,000	27,000	87,671	73,973	— 15.6	0.85	0.63	1,284,586	1.84
U.S.S.R. (Excl. Sakhalin)	270,163	287,500	740,173	787,671	+ 6.4	7.14	6.72	6,854,211	9.80
Yugoslavia	780	1,155	2,137	3,164	+ 48.1	0.02	0.02	3,611	0.01
Africa	**16,458**	**16,959**	**45,090**	**46,463**	**+ 3.0**	**0.44**	**0.40**	**170,646**	**0.24**
Algeria	52	101	142	277	+ 94.2	.....	.....	307	.....
Egypt	16,111	16,299	44,140	44,655	+ 1.2	0.43	0.38	168,912	0.24
Morocco	295	559	808	1,532	+ 89.5	0.01	0.02	1,427	.....
Asia, Total	**726,469**	**809,242**	**1,990,326**	**2,217,101**	**+ 11.4**	**19.20**	**18.93**	**6,840,512**	**9.80**
Asia, Middle East	**636,176**	**702,304**	**1,742,948**	**1,924,149**	**+ 10.4**	**16.82**	**16.42**	**4,712,521**	**6.75**
Bahrain	11,015	10,994	30,178	30,121	— 0.2	0.29	0.26	131,909	0.19
Iran	241,425	128,503	661,438	352,063	— 46.8	6.38	3.00	2,513,306	3.60
Iraq	46,760	61,534	128,110	168,586	+ 31.6	1.24	1.44	550,487	0.79
Kuwait	125,918	205,127	344,981	561,992	+ 62.9	3.33	4.80	489,701	0.70
Qatar	11,457	18,097	31,389	49,581	+ 58.0	0.30	0.42	30,304	0.04
Saudi Arabia	199,547	277,962	546,704	761,540	+ 39.3	5.28	6.50	996,568	1.43
Turkey	54	97	148	266	+ 79.6	.....	.....	246	.....
Asia, Far East	**90 293**	**106,928**	**247,378**	**292,953**	**+ 18.4**	**2.38**	**2.50**	**2,127,991**	**3.05**
Borneo, British (Sarawak and Brunei)	30,097	37,468	82,457	102,652	+ 24.5	0.79	0.88	251,449	0.36
Burma	450	644	1,233	1,764	+ 43.1	0.01	0.02		
India	1,867	1,900	5,115	5,205	+ 1.8	0.05	0.04	346,606	0.50
Pakistan	800	1,505	2,192	4,123	+ 88.1	0.02	0.04		
China	730	728	2,000	1,995	— 0.3	0.02	0.02	5,485	0.01
Formosa	23	24	63	66	+ 4.3	.....	.....	332	.....
Japan	2,048	2,306	5,611	6,318	+ 12.6	0.05	0.05	100,751	0.14
Indonesia	47,278	55,353	129,529	151,652	+ 17.1	1.25	1.29	1,322,128	1.89
Sakhalin (Part of U.S.S.R.)	7,000	7,000	19,178	19,178	.....	0.19	0.18	101,240	0.15
Australia-New Zealand	**1**	**1**	**3**	**3**	.....	.....	.....	**53**	.....
World, Undistributed	.....	.....	.....	.....	.....	.....	.....	**1,044**	.....
TOTAL WORLD	**3,783,332**	**4,277,320**	**10,365,293**	**11,718,685**	**+ 13.1**	**100.00**	**100.00**	**69,821,575**	**100.00**

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World Crude Oil Production, By Countries, By Years (Part 1)

(Complete production history of world, in thousands of barrels of 42 U. S. Gallons. Sources: *Mineral Resources and Minerals Yearbook*, except as otherwise indicated)

YEAR	WORLD TOTAL	Percent Produced by U.S.	NORTH AMERICA					SOUTH AMERICA										
			Canada	Mexico	United States	Cuba	Total North America	Argentina	Barbados	Bolivia	Brazil	Chile	Colombia	Ecuador	Peru	Trinidad	Venezuela	Total South America
1857	2																	
1858	4																	
1859	6	31			2		2											
1860	509	98			500		500											
1861	2,131	99			2,114		2,114											
1862	3,092	99	12		3,057		3,069											
1863	2,763	94	83		2,611		2,694											
1864	2,304	92	90		2,116		2,206											
1865	2,716	92	110		2,498		2,608											
1866	3,899	92	175		3,598		3,773											
1867	3,709	90	190		3,347		3,537											
1868	3,990	91	200		3,646		3,846											
1869	4,696	90	220		4,215		4,435											
1870	5,799	91	250		5,261		5,511											
1871	5,730	91	270		5,205		5,475											
1872	6,877	92	308		6,293		6,601											
1873	10,838	91	365		9,894		10,259											
1874	11,933	92	169		10,927		11,096											
1875	9,977	88	220		8,788		9,008											
1876	11,051	83	312		9,133		9,445											
1877	15,754	85	312		13,350		13,662											
1878	18,417	84	312		15,397		15,709											
1879	23,601	84	575		19,914		20,489											
1880	30,018	88	350		26,286		26,636											
1881	31,993	86	275		27,661		27,936											
1882	35,704	85	275		30,350		30,625											
1883	30,255	78	250		23,450		23,700											
1884	35,969	67	250		24,218		24,468											
1885	26,765	59	250		21,859		22,109											
1886	47,243	59	584		28,065		28,649											
1887	47,807	59	526		28,283		28,809											
1888	52,165	53	695		27,612		28,307											
1889	61,507	57	705		35,164		35,869											
1890	76,633	60	795		45,824		46,619											
1891	91,100	60	755		54,293		55,048											
1892	88,739	57	780		50,515		51,295											
1893	92,038	53	798		48,431		49,229											
1894	89,337	55	829		49,344		50,173											
1895	103,692	51	726		52,892		53,618											
1896	114,199	53	727		60,960		61,687								47			47
1897	121,992	50	710		60,476		61,186								71			71
1898	124,979	44	758		55,364		56,122								71			71
1899	131,147	44	808		57,071		57,879								89			89
1900	149,137	43	913		63,621		64,534								274			274
1901	167,440	41	757	10	69,389		70,156								275			275
1902	181,809	49	531	40	88,767		89,338								287			287
1903	194,879	52	487	75	100,461		101,023								278			278
1904	217,948	54	553	126	117,081		117,760								290			290
1905	215,091	63	634	251	134,717		135,602								373			373
1906	213,263	59	569	502	126,494		127,565								531			531
1907	263,957	63	789	1,005	166,095		167,889	B							751			751
1908	285,287	63	528	3,933	178,527		182,988	12							945	B		957
1909	298,709	61	421	2,714	183,171		186,306	18							1,411	57		1,486
1910	327,763	64	316	3,634	209,557		213,507	20							1,258	143		1,421
1911	344,361	64	291	12,553	220,449		233,293	13							1,465	285		1,763
1912	352,443	63	242	16,558	222,935		239,736	47							1,752	437		2,236
1913	385,345	64	228	25,696	248,446		274,370	131							2,071	504		2,706
1914	407,544	65	215	26,235	265,763		292,213	276							1,837	644		2,757
1915	432,033	65	215	32,911	281,104		314,230	513							2,579	750		3,842
1916	457,500	66	198	40,546	300,767		341,511	867							2,593	929		4,389
1917	502,891	67	214	55,293	335,316		390,823	1,218						57	2,577	1,602	120	5,574
1918	503,515	71	305	63,828	355,928		420,061	1,353						C60	2,527	2,082	333	6,355
1919	555,875	68	241	87,073	378,367		465,681	1,331						C60	2,628	1,841	425	6,285
1920	688,884	64	196	157,069	442,929		600,194	1,651						C60	2,817	2,083	457	7,068
1921	766,002	62	188	193,398	472,183		665,769	2,036					67	C60	3,699	2,354	1,433	9,649
1922	858,898	65	179	182,278	557,531		739,988	2,866					323	C60	5,314	2,445	2,201	13,209
1923	1,015,736	72	170	149,585	732,407		882,162	3,400					425	87	5,699	3,051	4,201	16,863
1924	1,014,318	70	161	139,678	713,940		853,779	4,639					445	C100	8,379	4,057	9,042	26,662
1925	1,068,933	71	332	115,515	763,743		879,590	6,336					1,007	160	9,232	4,387	19,687	40,809
1926	1,096,823	70	364	90,421	770,874		861,659	7,851					6,444	214	10,762	4,971	36,911	67,153
1927	1,262,582	71	477	64,121	901,129		965,727	8,630					15,014	537	10,127	5,380	63,134	102,822
1928	1,324,774	68	624	50,151	901,474		952,249	9,070					19,897	1,084	12,006	7,684	105,749	155,490
1929	1,485,867	68	1,117	44,688	1,007,323		1,053,128	9,391		B			20,385	1,381	13,422	8,716	137,472	190,767
1930	1,410,037	64	1,522	39,530	898,011		939,063	9,002		56			20,346	1,553	12,449	9,419	136,669	189,494
1931	1,372,532	62	1,543	33,039	851,081		885,663	11,709		25			18,237	1,762	10,089	9,744	116,613	168,179
1932	1,309,677	60	1,044	32,805	785,159		819,008	13,139		44			16,414	1,597	9,899	10,126	116,154	167,760
1933	1,442,146	63	1,145	34,001	905,656	23	940,825	13,691		112			13,158	1,620	13,257	9,561	117,720	169,119
1934	1,522,288	60	1,417	38,172	908,065	28	947,682	14,024		159			17,341	1,637	16,314	10,894	136,103	196,472
1935	1,654,495	60	1,447	40,241	996,596	47	1,038,331	14,297		164			17,598	1,732	17,067	11,671	148,254	210,783
1936	1,791,546	61	1,500	41,028	1,099,687	62	1,142,277	15,458		105			18,756	1,942	17,593	13,237	154,794	221,885
1937	2,039,231	63	2,944	46,907	1,279,160	33	1,329,044	16,355		122			20,599	2,161	17,457	15,503	186,230	258,427
1938	1,988,041	61	6,966	38,506	1,214,355	78	1,259,905	17,076		226			21,582	2,246	15,839	17,737	188,174	262,880
1939	2,086,160	60 6	7,838	42,898	1,264,962	112	1,315,810	18,613		215			23,857	2,313	13,508	19,270	206,470	284,246
1940	2,149,821	62.9	8,591	44,036	1,353,214	142	1,405,983	20,609		288	2		25,593	2,349	12,126	22,227	185,570	268,764
1941	2,220,657	63.1	10,134	42,196	1,402,228	150	1,454,708	21,873		235	3		24,553	1,557	11,935	20,506	228,430	309,092
1942	2,093,100	66.2	10,365	34,815	1,386,645	151	1,431,976	23,704	2	308	33		10,487	2,278	13,629	22,069	147,675	220,185
1943	2,256,637	66.7	10,052	35,163	1,505,613	107	1,550,935	27,714	2	334	48		13,261	2,315	14,654	21,385	177,631	257,344
1944	2,592,289	64.7	10,099	38,203	1,677,904	109	1,726,315	24,230	1	314	58		22,291	2,967	14,389	22,139	257,046	343,435
1945	2,594,697	66.0	8,483	43,547	1,713,655	149	1,765,834	22,881	2	382	79		22,449	2,664	13,744	21,093	323,156	406,450
1946	2,745,430	63.2	7,586	49,235	1,733,939	269	1,791,029	20,604	1	363	67		22,118	2,323	12,468	20,233	388,486	466,663
1947	3,022,139	61.4	7,692	56,284	1,856,987	300	1,921,263	21,846	B	377	97		24,794	2,282	12,764	20,521	434,905	517,586
1948	3,433,213	58.8	12,287	58,508	2,020,185	159	2,091,139	23,734	B	464	144		23,792	2,563	14,069	20,111	490,015	574,892
1949	3,404,099	54.1	21,305	60,910	1,841,940	206	1,924,361	22,589		678	109		29,722	2,617	14,790	20,617	482,316	573,438
1950	3,783,332	52.1	28,412	72,117	1,971,845	156	2,072,530	23,361	B	616	339	630	26,323	2,690	15,027	20,299	548,343	637,628
1951	4,277,320	52.5	47,112	77,089	2,244,404	118	2,368,723	24,407	B	514	756	759	38,148	2,715	16,109	20,532	622,187	726,127
Total	69,821,575	61.8	237,959	2,559,117	43,161,763	2,399	45,961,238	482,585	8	6,101	1,735	1,389	535,426	51,803	417,613	433,296	6,174,493	8,104,449

* WORLD OIL from private sources. B Less than 1,000 barrels. C Estimated production.

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World Crude Oil Production, By Countries, By Years (Part 2)

(Complete production history of world, in thousands of barrels of 42 U. S. Gallons. Sources: *Mineral Resources and Minerals Yearbook*, except as otherwise indicated)

	EUROPE														AFRICA			
Year	Albania	Austria	Czecho-slovakia	Great Britain	France	Ger-many	Hun-gary	Italy	Nether-lands	Poland	Rou-mania	[F]U.S.S.R. (Russia)	Yugo-slavia	[F]Total Europe	Egypt	Algeria	Morocco	Total Africa
1857											2			2				
1858											4			4				
1859											4			4				
1860											9			9				
1861								[B]			17			17				
1862								[B]			23			23				
1863								[B]			28	41		69				
1864								[B]			33	65		98				
1865								2			39	67		108				
1866								1			42	83		125				
1867								1			51	120		172				
1868								[B]			56	88		144				
1869								[B]			59	202		261				
1870								[B]			84	204		288				
1871								[B]			90	165		255				
1872								[B]			91	185		276				
1873								[B]			104	475		579				
1874								1		150	103	583		837				
1875								1		158	108	697		964				
1876								3		164	111	1,321		1,599				
1877								3		170	108	1,801		2,082				
1878								4		176	109	2,401		2,690				
1879								3		215	110	2,761		3,089				
1880						9		2		229	115	3,001		3,356				
1881						29		1		287	122	3,601		4,040				
1882						58		2		330	136	4,538		5,064				
1883						27		2		365	139	6,002		6,535				
1884						46		3		408	211	10,805		11,473				
1885						41		2		465	193	13,925		14,626				
1886						74		2		306	168	18,006		18,556				
1887						74		1		344	182	18,368		18,969				
1888						85		1		467	219	23,049		23,821				
1889						68		1		515	298	24,609		25,491				
1890						108		3		659	383	28,691		29,844				
1891						109		8		631	488	34,573		35,809				
1892						101		18		646	593	35,775		37,133				
1893						100		19		693	535	40,457		41,804				
1894						123		21		949	508	36,375		37,976				
1895						121		26		1,453	576	46,140		48,316				
1896						145		18		2,444	543	47,221		50,371				
1897						166		14		2,226	571	54,399		57,376				
1898						184		15		2,376	776	61,610		64,961				
1899						192		16		2,314	1,426	65,955		69,903				
1900						358		12		2,347	1,629	75,780		80,126				
1901						314		16		3,251	1,678	85,168		90,427				
1902						354		19		4,142	2,060	80,540		87,115				
1903						446		18		5,235	2,763	75,591		84,053				
1904						637		26		5,947	3,599	78,537		88,746				8
1905						561		44		5,766	4,421	54,960		65,752				90
1906						579		54		5,468	6,378	58,897		71,376				73
1907						757		60		8,456	8,118	61,851		79,242				431
1908						1,009		51		12,612	8,252	62,187		84,111				51
1909						1,019		42		14,933	9,327	65,970		91,291				37
1910						1,032		51		12,673	9,724	70,337		93,817				7
1911						1,017		75		10,519	11,108	66,184		88,903	21			21
1912						1,031		54		8,535	12,976	68,019		90,615	214			214
1913						857		47		7,818	13,555	62,834		85,111	98			98
1914						781		40		6,436	12,827	67,020		87,104	753	1		754
1915						703		44		5,352	12,030	68,548		86,677	212	4		216
1916						656		51		6,587	8,945	65,817		82,056	404	8		412
1917					[G]	642		41		6,228	3,721	63,072		73,704	943	9		952
1918					363	270		35		6,032	8,730	27,168		42,598	1,935	7		1,942
1919			48	2	334	265		35		6,096	6,618	31,752		45,150	1,517	5		1,522
1920			69	3	356	246		35		5,607	7,435	25,430		39,181	1,042	4		1,046
1921			94	3	389	274		32		5,167	8,368	28,968		43,295	1,255	3		1,258
1922			120	1	496	319		31		5,227	9,843	35,692		51,729	1,188	9		1,197
1923			74	1	494	346		34		5,402	10,867	39,147		56,365	1,054	9		1,063
1924			76	2	497	406		39		5,657	13,369	45,355		65,401	1,122	11		1,133
1925			158	3	459	541		61		5,960	16,650	52,448		76,280	1,226	12		1,238
1926			150	2	478	653		41		5,844	23,314	64,311		94,793	1,188	9		1,197
1927			112	2	504	663		47		5,342	26,368	77,018		110,056	1,267	8		1,275
1928			94	1	512	630		46		5,492	30,773	[D]84,745		122,293	1,842	8		1,850
1929			93		535	704		45		4,988	34,758	[D]99,507		140,630	1,868	20		1,888
1930			157	[B]	523	1,182		59		4,904	41,624	[D]125,555		174,004	1,996	16		2,012
1931			134	[E]	520	1,606		124		4,662	49,127	162,842		219,015	2,038	[E]		2,038
1932			126	[E]	530	1,608		208		4,116	53,815	154,367		214,770	1,895	[E]	7	1,902
1933	11		122	[E]	562	1,665		204		4,072	54,020	154,840		215,496	1,663	[E]	7	1,670
1934	10		178	[E]	557	2,187		151		3,913	62,063	174,318		243,377	1,546	[E]	6	1,552
1935	41	44	133	[E]	541	2,996		119		3,812	61,310	182,386	2	251,384	1,301	[E]	4	1,305
1936	273	50	127	[E]	503	3,115		123		3,789	63,659	186,206	1	257,846	1,278	[E]	4	1,282
1937	619	221	123	[E]	502	3,176	16	110		3,716	52,452	193,241	4	254,180	1,196	[E]	22	1,218
1938	752	383	130	[E]	513	3,861	288	101		3,763	48,487	204,956	9	263,243	1,581	[E]	27	1,608
1939	934	1,240	120		500	4,487	1,103	91		3,898	45,648	216,866	10	274,897	4,666	[E]	27	4,693
1940	1,497	2,808	163	124	496	7,371	1,881	85		3,891	43,168	218,600	10	280,094	6,505	[E]	27	6,532
1941	1,334	4,238	182	223	414	6,303	3,183	95		1,793	40,517	238,150	10	296,443	8,546	[E]	27	8,573
1942	1,601	5,899	271	605	463	5,191	5,037	101		2,794	42,094	227,470	10	291,536	8,275	[E]	41	8,316
1943	1,001	7,478	200	839	356	4,973	6,347	86	1	3,500	39,182	200,750	10	264,723	8,953		39	8,992
1944	344	8,218	185	703	300	6,154	6,277	55	12	3,000	26,191	275,000	220	326,649	9,416	4	32	9,452
1945	267	3,074	91	532	202	3,935	5,018	53	41	750	34,772	148,953	200	197,888	9,406	2	26	9,434
1946	1,000	5,734	196	412	368	4,539	5,146	83	435	866	31,434	157,673	160	208,046	9,070	1	20	9,091
1947	2,000	6,285	210	351	356	4,032	4,330	81	1,478	951	28,552	187,463	290	236,379	8,627	1	21	8,649
1948	1,500	6,149	204	323	370	4,489	3,647	71	3,443	1,039	34,000	218,000	270	273,505	13,398	1	100	13,499
1949	2,188	6,100	292	338	411	5,947	3,791	71	4,314	1,205	33,700	237,700	470	296,527	15,997	2	136	16,135
1950	2,101	6,150	280	340	893	7,904	3,460	72	4,898	1,205	32,000	270,163	780	330,246	16,111	52	295	16,458
1951	2,401	15,010	350	335	2,117	9,566	4,500	72	4,964	1,298	27,000	287,500	1,155	356,268	16,299	101	559	16,959
Total	19,864	79,081	5,063	5,145	17,414	116,217	54,024	3,635	19,586	281,196	1,284,586	6,854,211	3,611	8,743,633	168,912	307	1,427	170,646

* **WORLD OIL** from private sources fields in Russian Asia other than Sakhalin.

[B] Less than 1,000 barrels. [C] Estimated production. [D] Year ended September 30. [E] No more data available. [F] Includes [G] France's earlier production credited to Germany.

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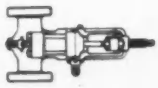
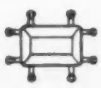
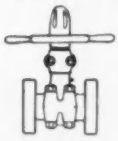
Pressure-Operated Blowout Preventers



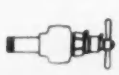
Pressure-Operated Flowline Valves



Alloy Steel Mud Crosses



Flex-Seal Mud Valves



Adjustable and Positive Chokes

Mud Line Pressure Gauges

World Crude Oil Production, By Countries, By Years (Part 3)

(Complete production history of world, in thousands of barrels of 42 U. S. Gallons. Sources: *Mineral Resources and Minerals Yearbook*, except as otherwise indicated.)

	ASIA — Middle East								ASIA — Far East													
										[E]Burma-India Pakistan												
Year	Bahrain	Iran	Iraq	Kuwait	Qatar	Saudi Arabia	Turkey	Total Middle East	British Borneo	Burma	Pakistan	India	China	Formosa [F]	Japan	Indonesia	Sakhalin	Total Far East	[F]Total Asia	Australia-N.Z.	Rest of World
1857																					
1858																					
1859																					
1860																					
1861																					
1862																					
1863																					
1864																					
1865																					
1866																					
1867																					
1868																					
1869																					
1870																					
1871																					
1872																					
1873																					
1874																					
1875															5			5	5		
1876															7			7	7		
1877															10			10	10		
1878															18			18	18		
1879															23			23	23		
1880															26			26	26		
1881															17			17	17		
1882															15			15	15		
1883															20			20	20		
1884															28			28	28		
1885															30			30	30		
1886															38			38	38		
1887															29			29	29		
1888															37			37	37		
1889											94				53			147	147		
1890											118				52			170	170		
1891											190				53			243	243		
1892											242				69			311	311		
1893											299				106	600		1,005	1,005		
1894											327				173	688		1,188	1,188		
1895											372				170	1,216		1,758	1,758		
1896											430				237	1,427		2,094	2,094		
1897											546				262	2,552		3,360	3,360		
1898											542				319	2,964		3,825	3,825		
1899											941				539	1,796		3,276	3,276		
1900											1,079				871	2,253		4,203	4,203		
1901											1,431				1,117	4,014		6,562	6,562		20
1902											1,617				996	2,430		5,043	5,043		26
1903											2,510				1,209	5,770		9,489	9,489		36
1904											3,385				1,219	6,508		11,112	11,112		40
1905											4,137				1,347	7,850		13,334	13,334		30
1906											4,016				1,564	8,181		13,761	13,761		30
1907											4,344				1,718	9,983		16,045	16,045		30
1908											5,047				1,871	10,283		17,201	17,201		30
1909											6,677				1,887	11,042		19,606	19,606		20
1910											6,138				1,829	11,031		18,998	18,998		20
1911											6,451				1,737	12,173		20,361	20,361		20
1912											7,117				1,659	10,846		19,622	19,622		20
1913		1,857						1,857	141		7,930				1,940	11,172		21,183	23,040		20
1914		2,910						2,910	318		7,410				2,636	11,422		21,786	24,696		20
1915		3,616						3,616	392		8,202				2,928	11,920		23,442	27,058		10
1916		4,477						4,477	629		8,491				2,963	12,547		24,630	29,107		23
1917		7,147						7,147	542		8,079				2,861	13,180		24,662	31,809		28
1918		8,623						8,623	504		8,188				2,441	12,778		23,911	32,534		25
1919		10,139						10,139	596		8,736				2,238	15,508		27,078	37,217		20
1920		12,230						12,230	1,020		8,375				2,221	17,529		29,145	41,375		20
1921		16,673						16,673	1,411		8,734				2,233	16,958	2	29,338	46,011		26
1922		22,247						22,247	2,849		8,529				2,055	17,066	7	30,506	52,753		22
1923		25,230						25,230	3,940		8,406				1,804	19,870	9	34,029	59,259		24
1924		32,373						32,373	4,163		8,416				1,814	20,473	80	34,946	67,319		24
1925		35,038						35,038	4,257		8,274				1,915	21,422	87	35,955	70,993		23
1926		35,842						35,842	4,942		8,011				1,785	21,243	181	36,162	72,004		17
1927		39,688	338					40,026	4,943		8,032				1,789	27,459	440	42,663	82,689		13
1928		43,461	713					44,174	[G]5,223		8,741				1,944	32,118	677	48,703	92,877		15
1929		42,145	798					42,943	5,290		8,747				2,023	39,279	[D]1,134	56,473	99,416		38
1930		45,828	913					46,741	4,907		8,292				1,950	41,729	[D]1,805	58,683	105,424		40
1931		44,376	830					45,206	3,854		8,200				2,050	35,539	2,734	52,377	97,583		54
1932		49,471	836					50,307	3,796		8,817				1,630	39,001	2,631	55,875	106,182		62
1933	31	54,392	917					55,340	4,490		8,743				1,455	42,606	2,338	59,632	114,972		71
1934	285	57,851	7,689					65,825	5,140		10,503				1,834	46,925	2,881	67,283	133,108		96
1935	1,265	57,273	27,408					85,946	5,546	7,181	[E]	2,038			2,249	47,171	2,545	66,730	152,676	5	4
1936	4,645	62,718	30,406			20		97,789	5,209	7,588	[E]	1,978			2,440	50,025	3,212	70,452	168,241	5	4
1937	7,762	77,804	31,836			65		117,467	6,009	7,848	[E]	2,162			2,488	56,724	3,656	78,887	196,354	4	4
1938	8,298	78,372	32,643			495		119,808	6,913	7,538	[E]	2,488			2,511	57,318	[C]3,821	80,589	200,397	4	4
1939	7,589	78,151	30,791			3,934		120,465	7,097	7,873	[E]	2,327	4		2,654	62,087	4,000	86,042	206,507	3	4
1940	7,074	66,317	24,225			5,075		102,691	7,047	7,731	[E]	2,302	10		2,639	62,011	4,000	85,740	188,431	3	14
1941	6,794	50,777	12,650			4,310		74,531	6,864	7,762	[E]	2,899	87	62	1,929	53,704	4,000	77,307	151,838	3	
1942	6,241	72,256	19,726			4,530		102,753	3,000	2,500	[E]	2,792	340	48	1,652	24,000	4,000	38,332	141,085	2	
1943	6,572	74,612	24,848			4,868		110,900	4,500	1,900	[E]	2,735	447	38	1,727	48,294	5,000	63,741	174,641	2	
1944	6,714	102,045	30,943			7,794		147,496	6,000	750	[E]	2,784	505	40	1,601	22,260	5,000	38,940	186,436	2	
1945	7,309	130,526	35,112			21,311		194,258	2,100	725	[E]	2,363	484	14	1,544	7,600	6,000	20,830	215,088	3	
1946	8,010	146,819	35,665	5,931		59,944		256,369	2,050	15	[E]	2,193	513	16	1,343	2,100	6,000	14,230	270,599	2	
1947	9,411	154,998	35,834	16,225		89,852		306,320	12,970	59	356	1,863	374	22	1,276	8,020	[C]7,000	31,940	338,260	2	
1948	10,915	190,384	26,115	46,500		142,853		416,767	20,124	341	490	1,875	533	23	1,122	31,900	[C]7,000	63,408	480,175	3	
1949	10,985	204,712	30,957	90,000	750	174,008	95	511,507	25,108	248	824	1,906	730	22	1,353	44,932	7,000	82,123	593,630	8	
1950	11,015	241,425	46,760	125,918	11,457	199,547	54	636,176	30,097	450	800	1,867	730	23	2,048	47,278	7,000	90,293	726,469	1	
1951	10,994	128,503	61,534	205,127	18,097	277,962	97	702,314	37,468	644	1,505	1,900	728	24	2,306	55,353	7,000	106,928	809,242	1	
Total	131,909	2,513,306	550,487	489,701	30,304	996,568	246	4,712,521	251,449		346,606		5,485	332	100,751	1,322,128	101,240	2,127,991	6,840,512	53	1,044

• **WORLD OIL** from private sources. [B] Less than 1,000 barrels. [C] Estimated production. [D] Year ended September 30 [E] Separation of British India and Burma prior to 1935 not available from U.S. Bureau of Mines data used here. Data by Dudley Stamp in "Petroleum Development and Technology, 1933," and in A.I.M.E. "Transactions" indicate cumulative through 1934 as follows: Burma 184,528, India 20,756. Pakistan included with India prior to 1947. [F] Exclusive of U.S.S.R. fields in Asia, other than Sakhalin, which are included with U.S.S.R. in Europe. [G] Beginning of production in Brunei. [H] Formosa included with Japan prior to 1941.

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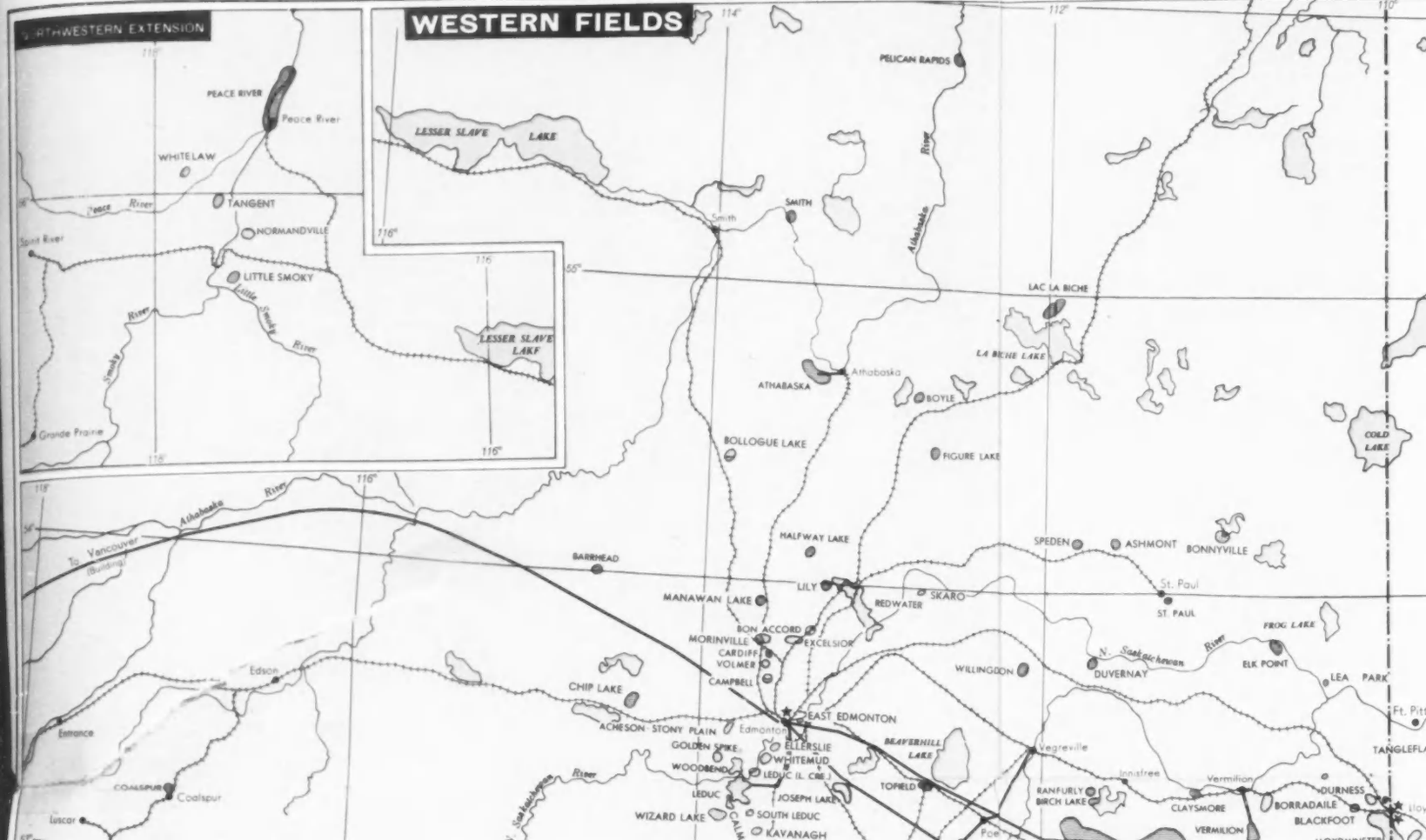
NORTHWESTERN EXTENSION
WESTERN FIELDS
PEACE RIVER
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WHITELAW
TANGENT
NORMANDVILLE
LITTLE SMOKY
Little Smoky River
Smoky River
Grande Prairie
LESSER SLAVE LAKE
PELICAN RAPIDS
LESSER SLAVE LAKE
Athabaska River
SMITH
Smith
LAC LA BICHE
LA BICHE LAKE
ATHABASKA
Athabaska
BOYLE
BOLLOGUE LAKE
FIGURE LAKE
COLD LAKE
To Vancouver (Building)
BARRHEAD
HALFWAY LAKE
SPEDEN
ASHMONT
BONNYVILLE
LILY
SKARO
REDWATER
MANAWAN LAKE
St. Paul
ST. PAUL
BON ACCORD
MORINVILLE
CARDIFF
VOLMER
EXCELSIOR
CAMPBELL
FROG LAKE
ELK POINT
WILLINGDON
DUVERNAY
N. Saskatchewan River
LEA PARK
Edson
CHIP LAKE
Entrance
ACHESON
STONY PLAIN
Edmonton
EAST EDMONTON
GOLDEN SPIKE
ELLERSLIE
WHITEMUD
BEAVERHILL LAKE
Vegreville
WOODBEND
LEDUC (L. CRK.)
Innisfree
Vermilion
COALSPUR
Coalspur
LEDUC
TOFIELD
RANFURLY
BIRCH LAKE
CLAYSMORE
DURNESS
BORRADAILE
BLACKFOOT
Luscar
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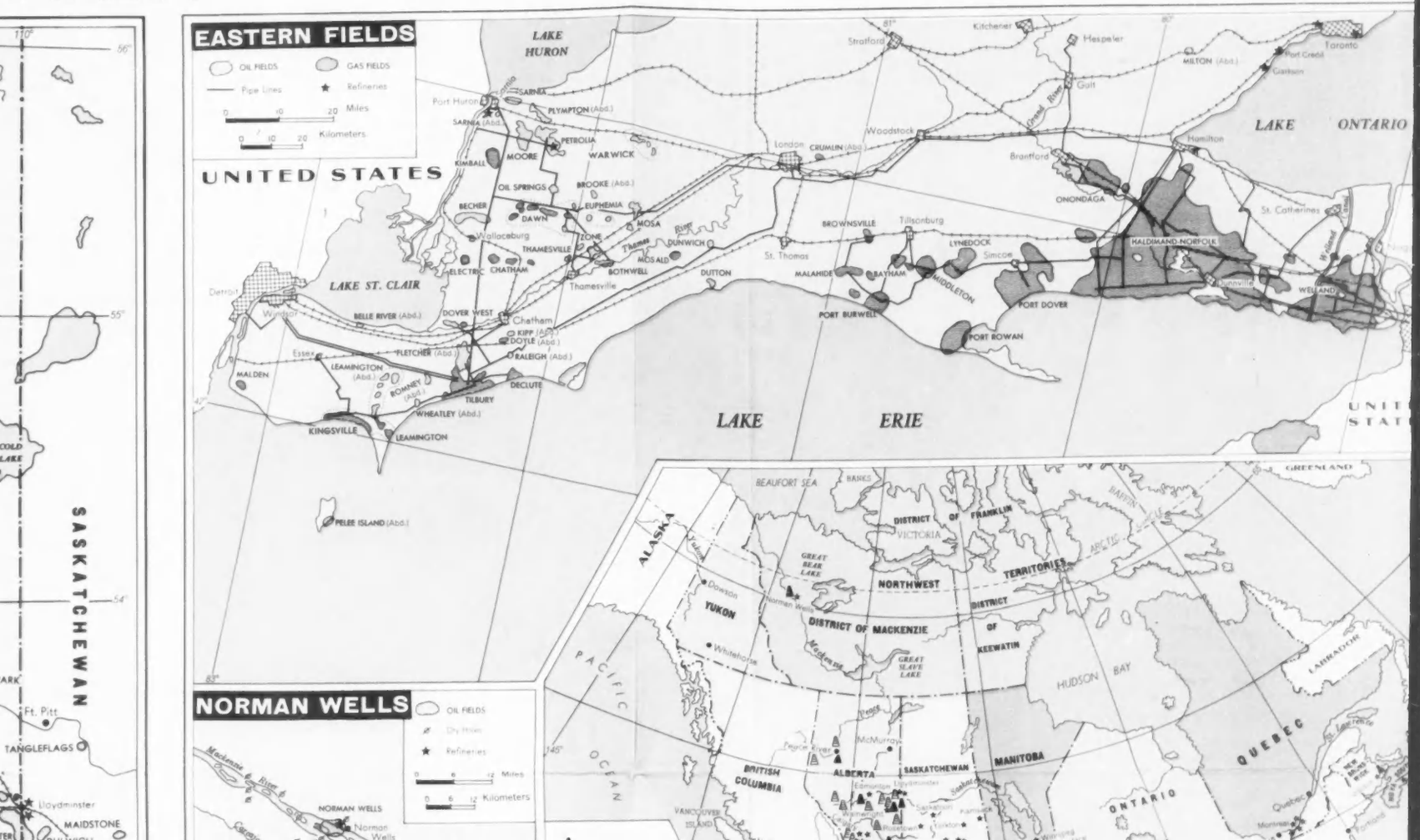

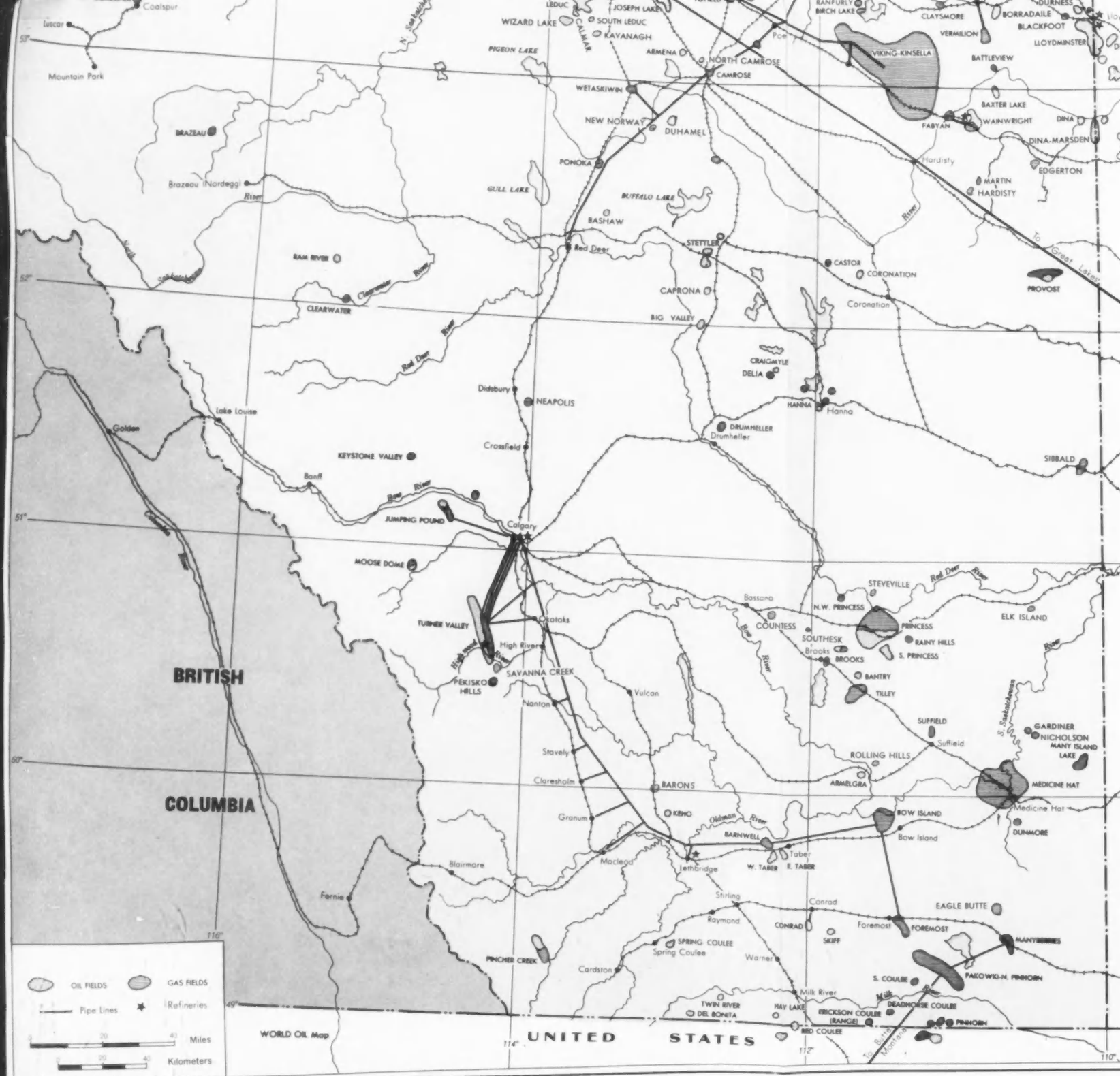

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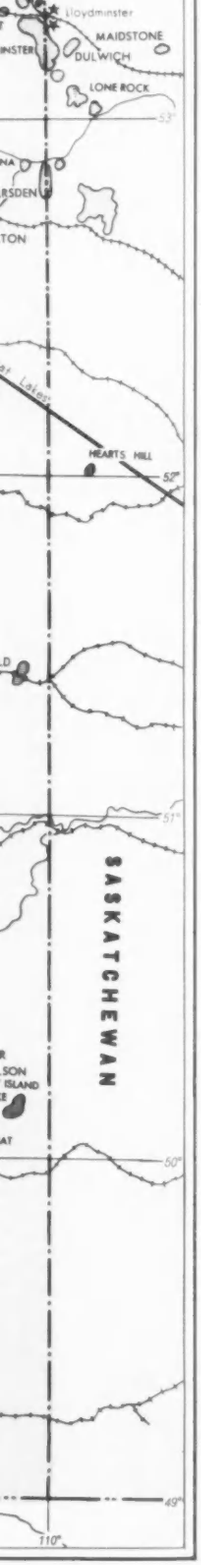

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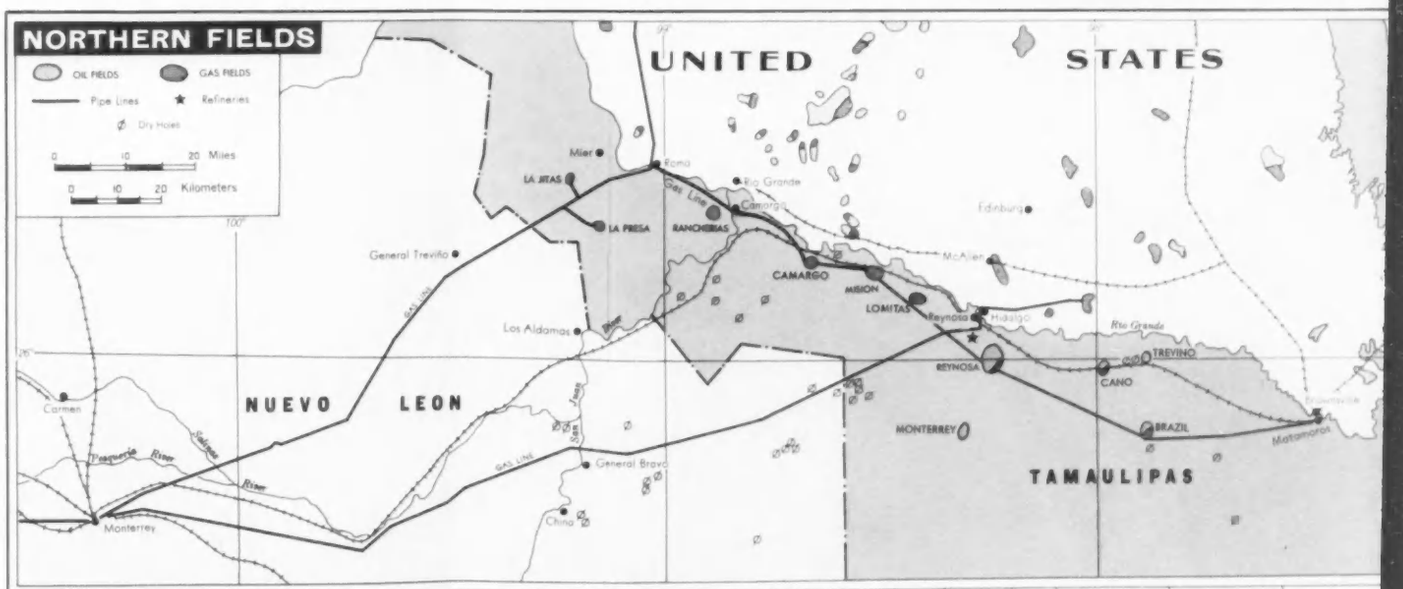

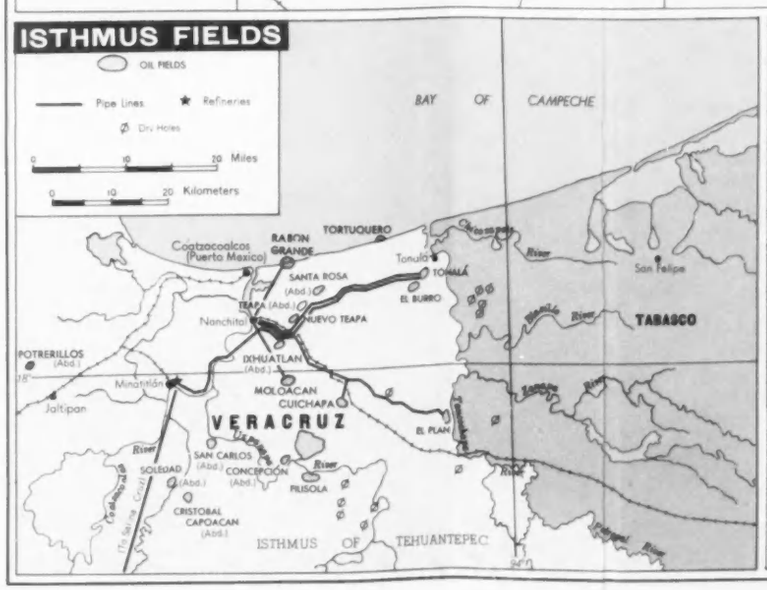

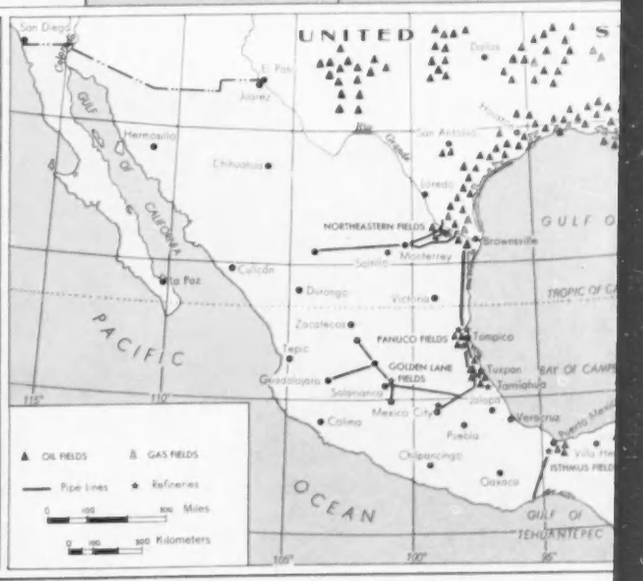

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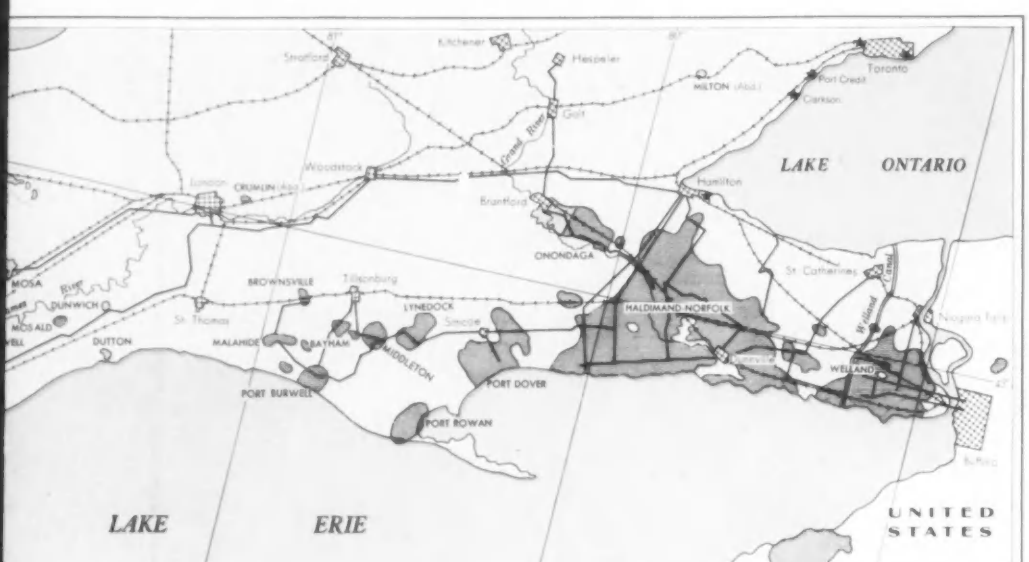

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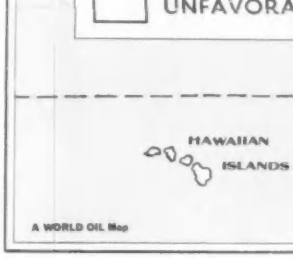

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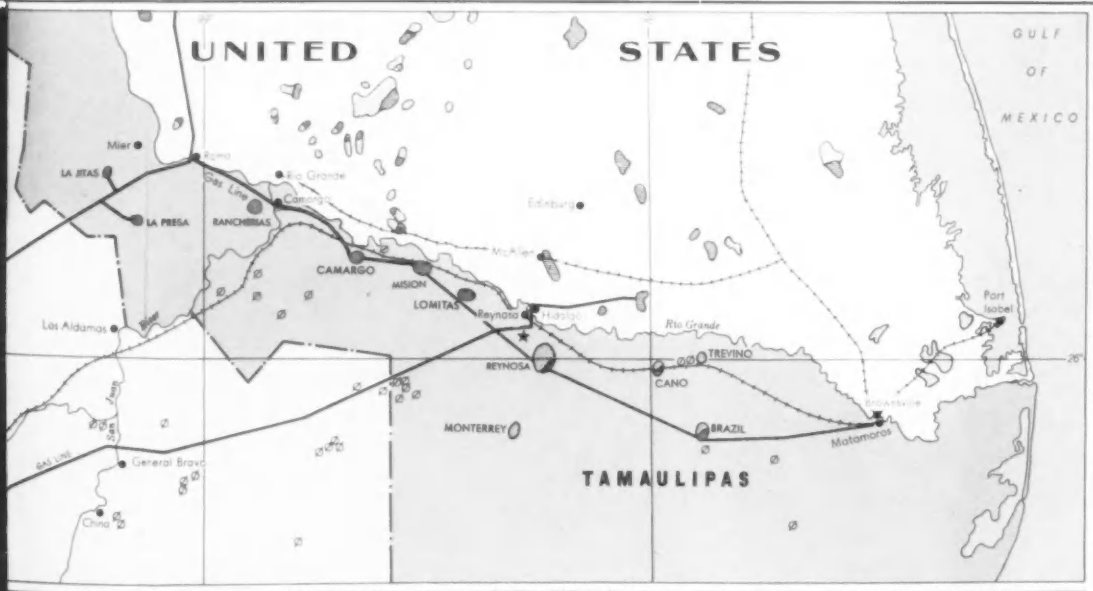
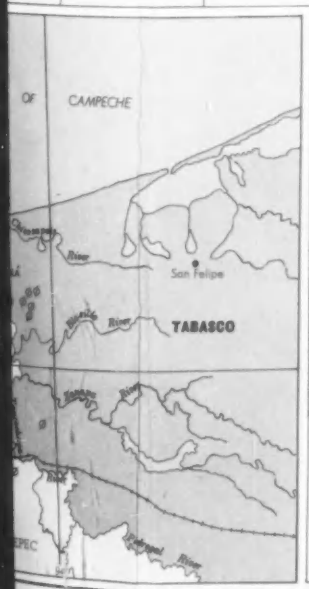
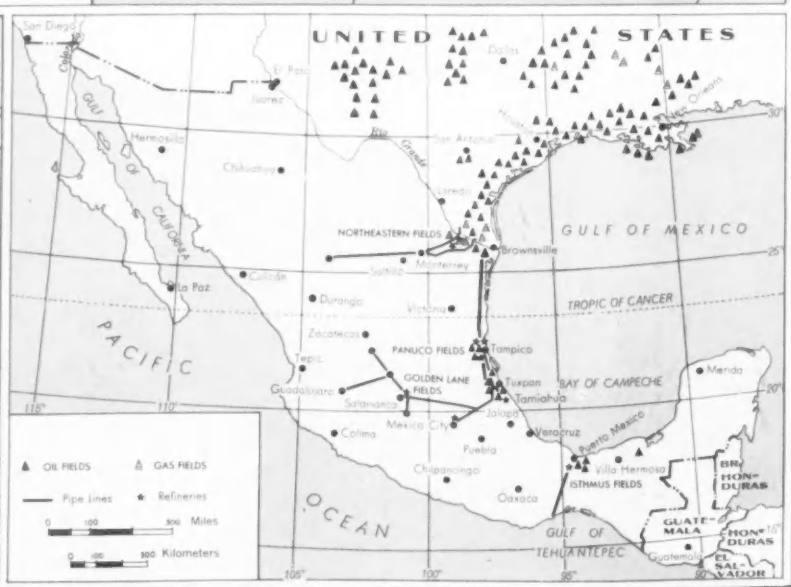
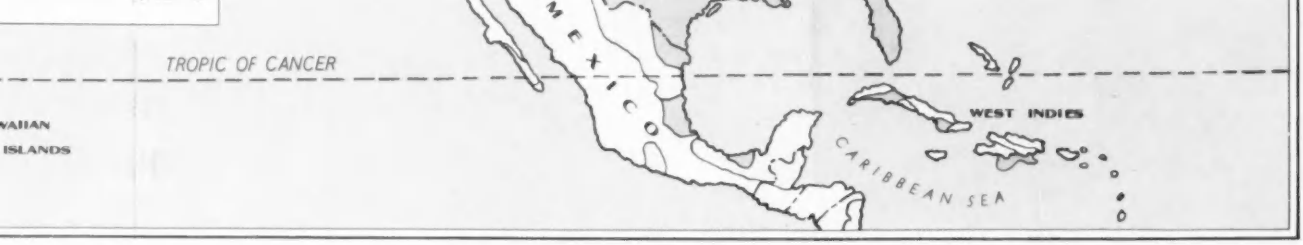






1952 OIL MAP



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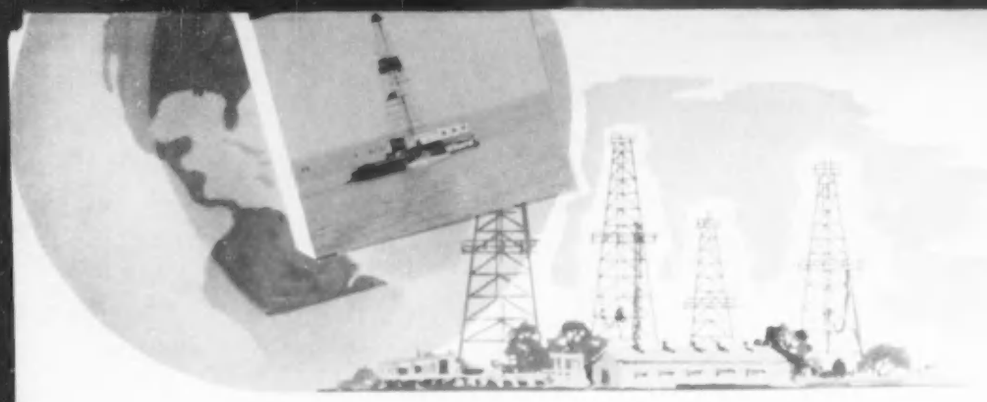

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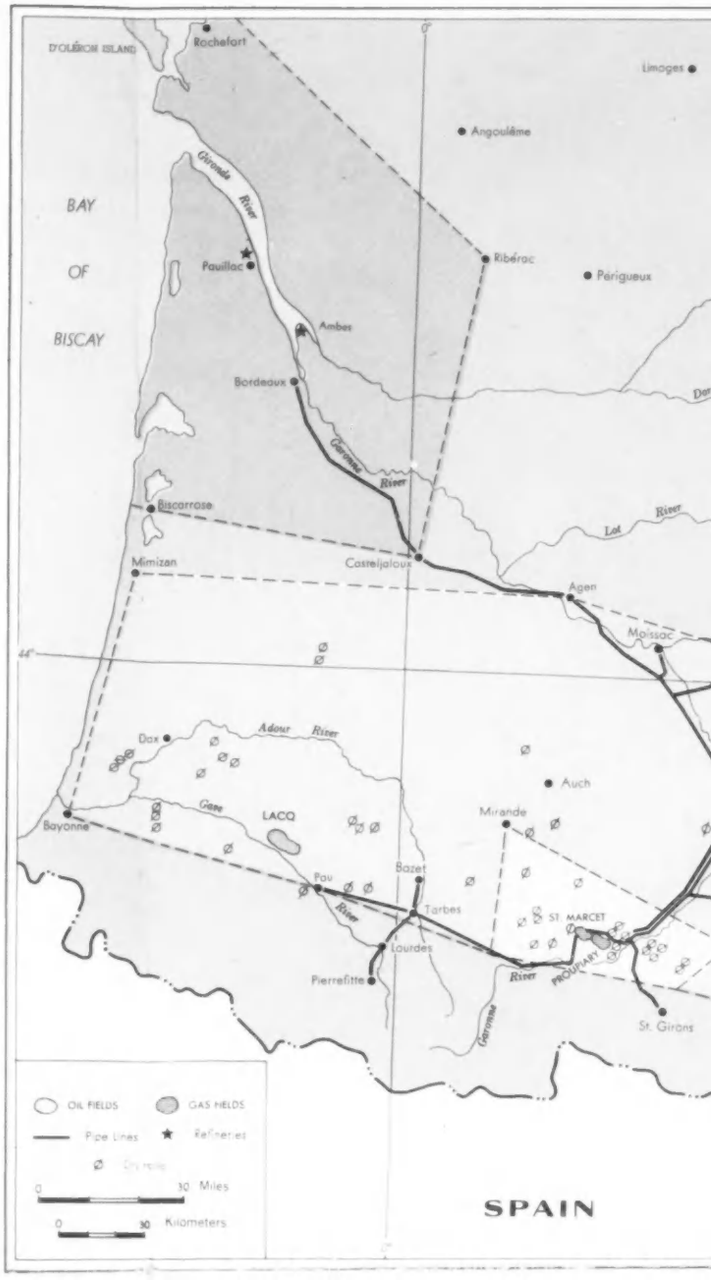

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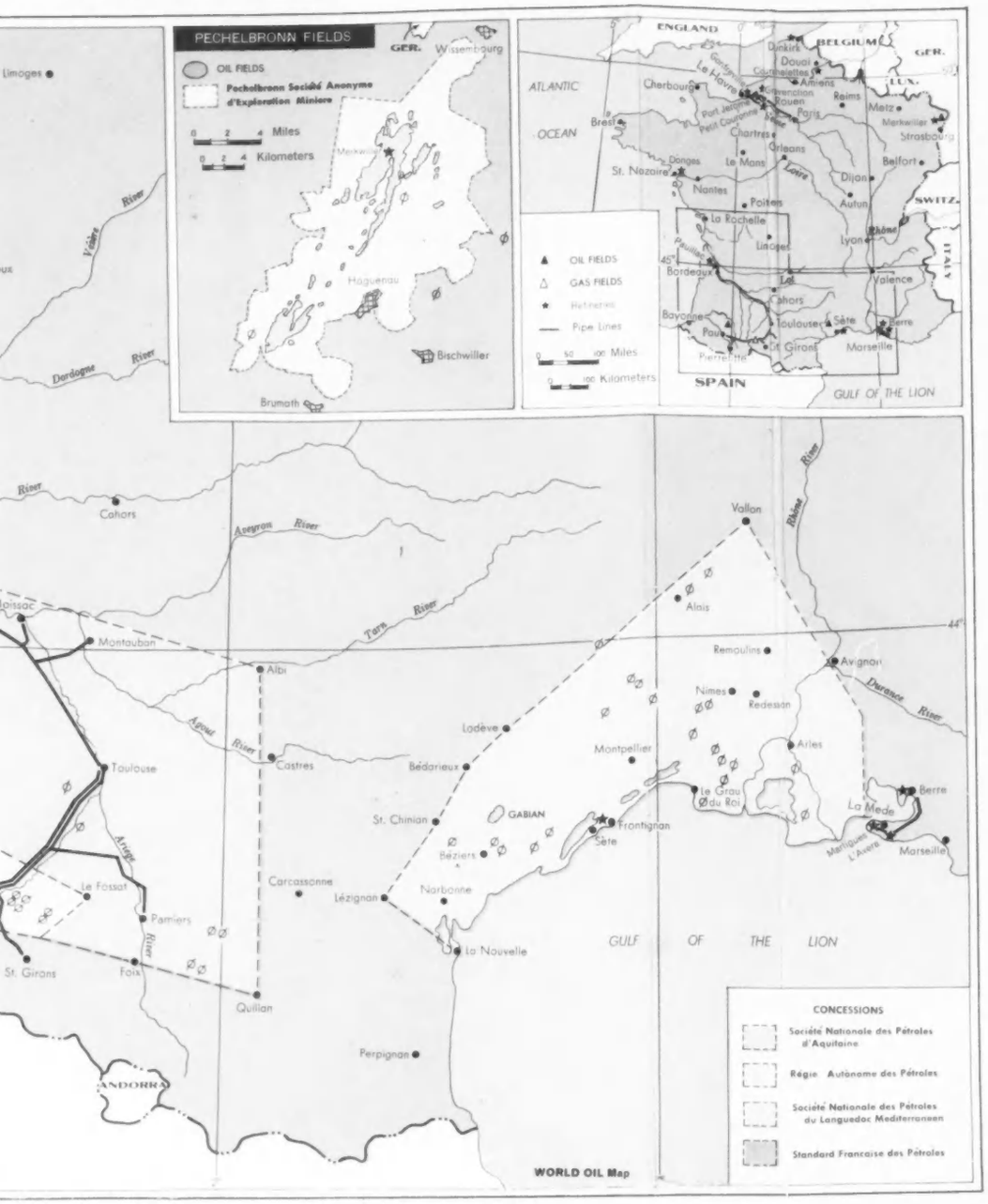

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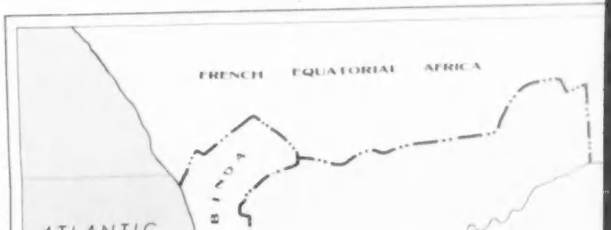

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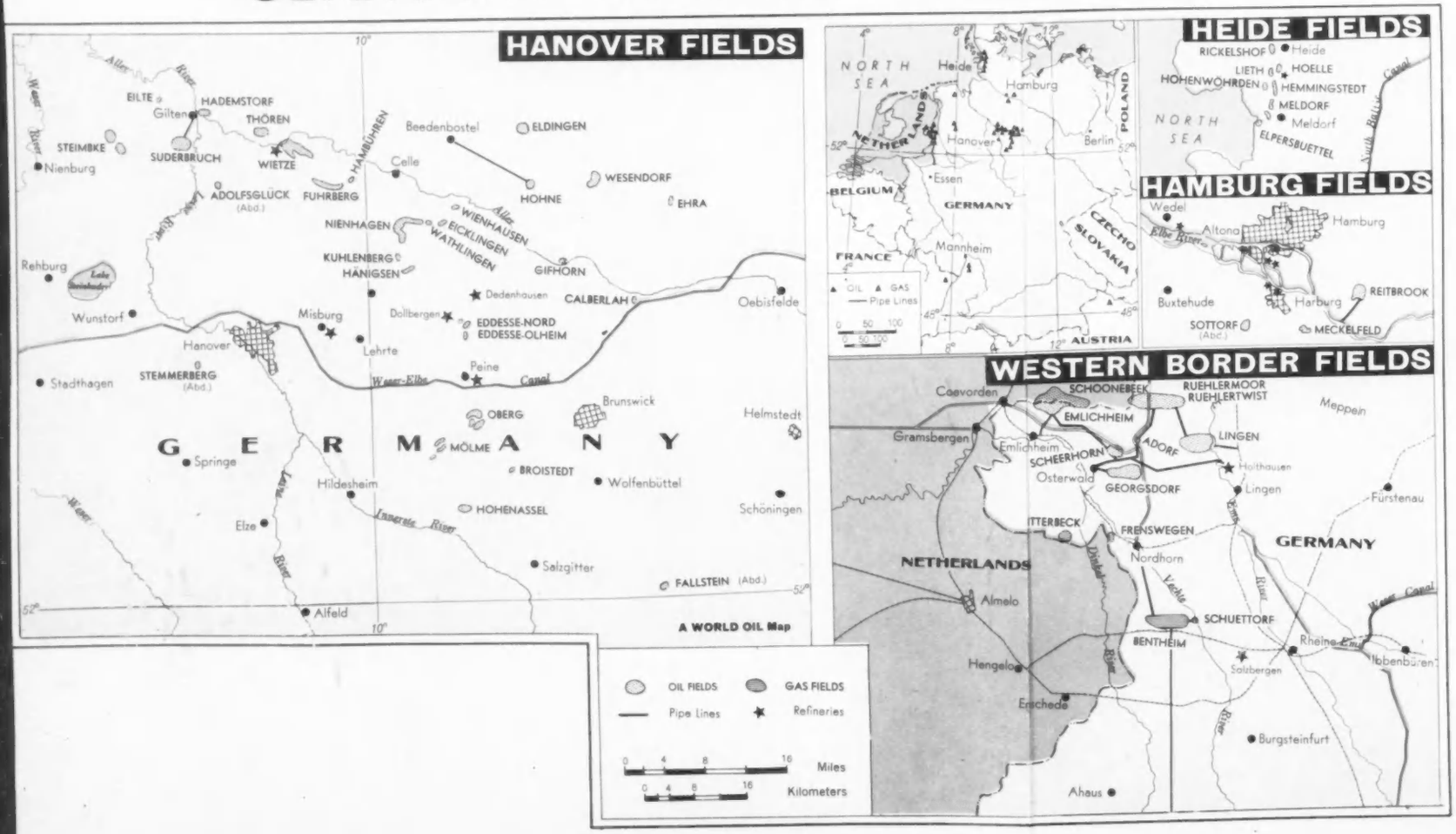

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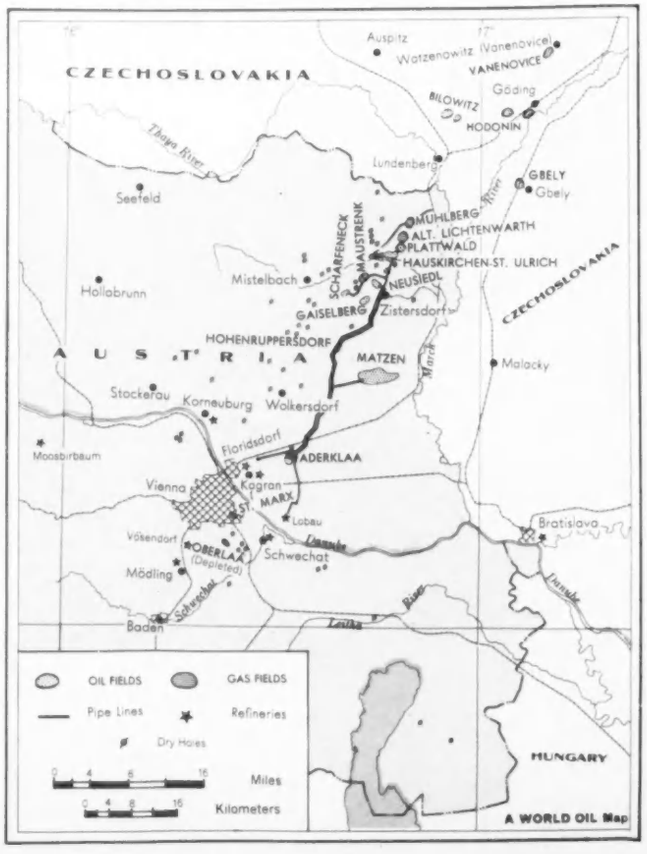

ALGERIA

1952 OIL MAP

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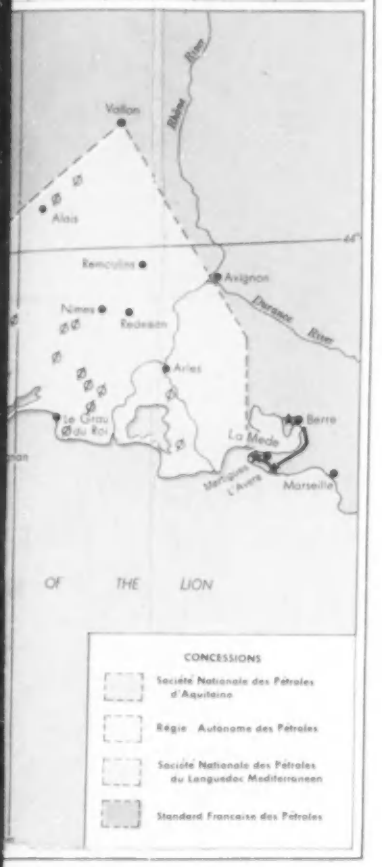

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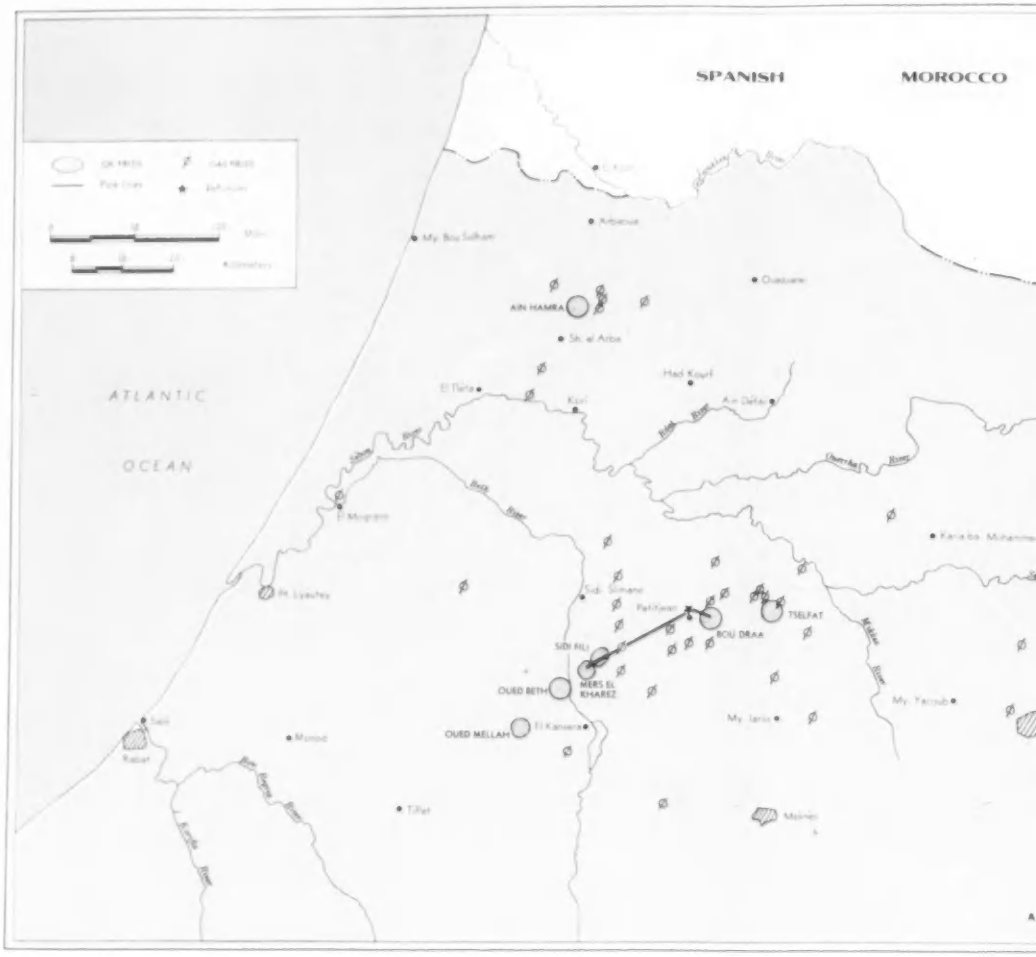

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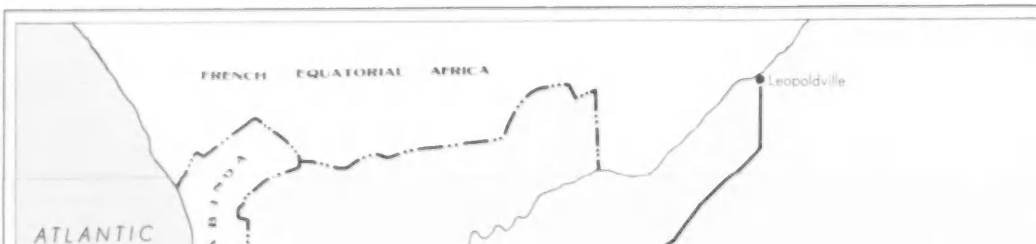

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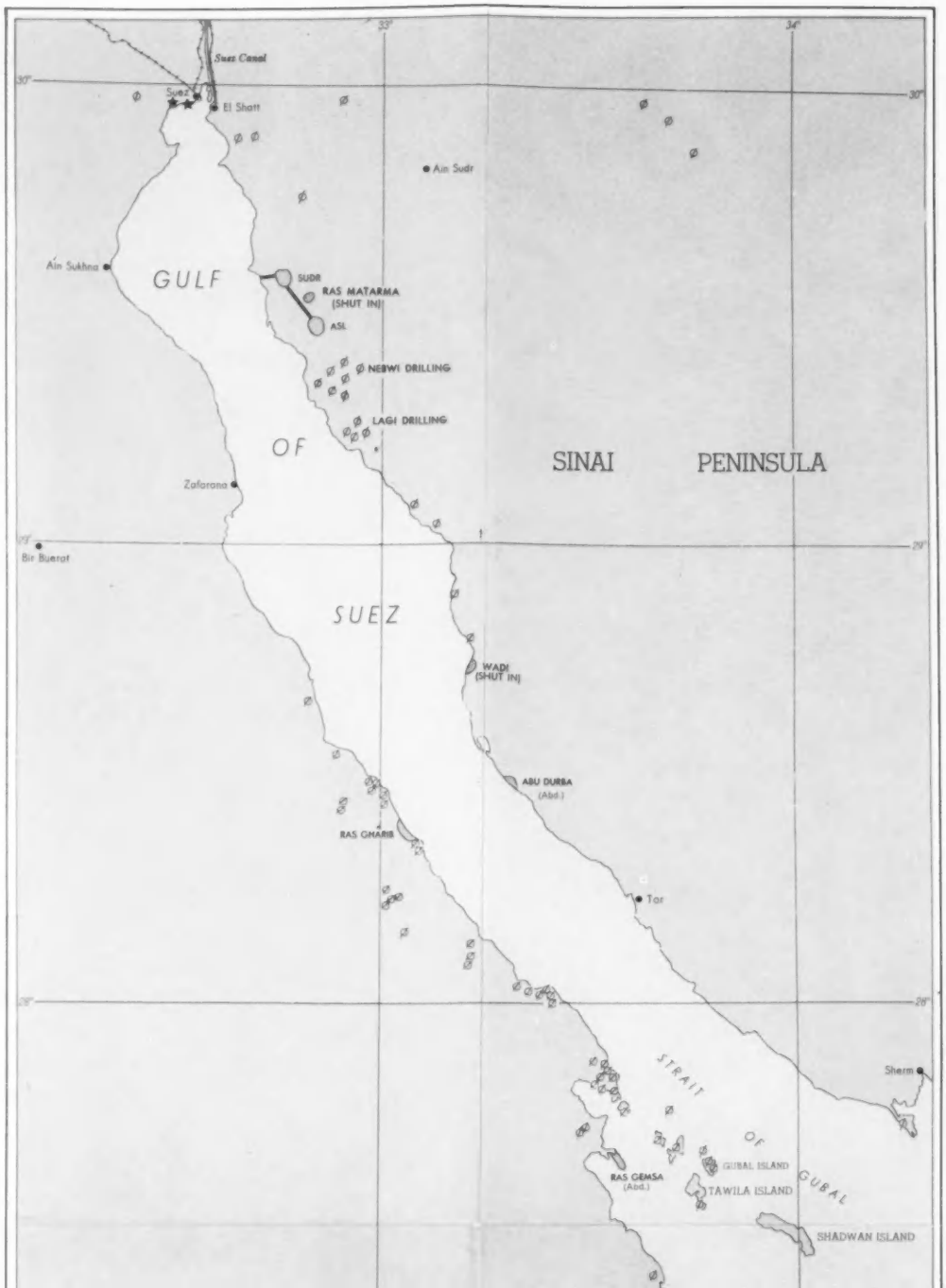
EGYPT



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Miles
Kilometers
27°
33°
34°
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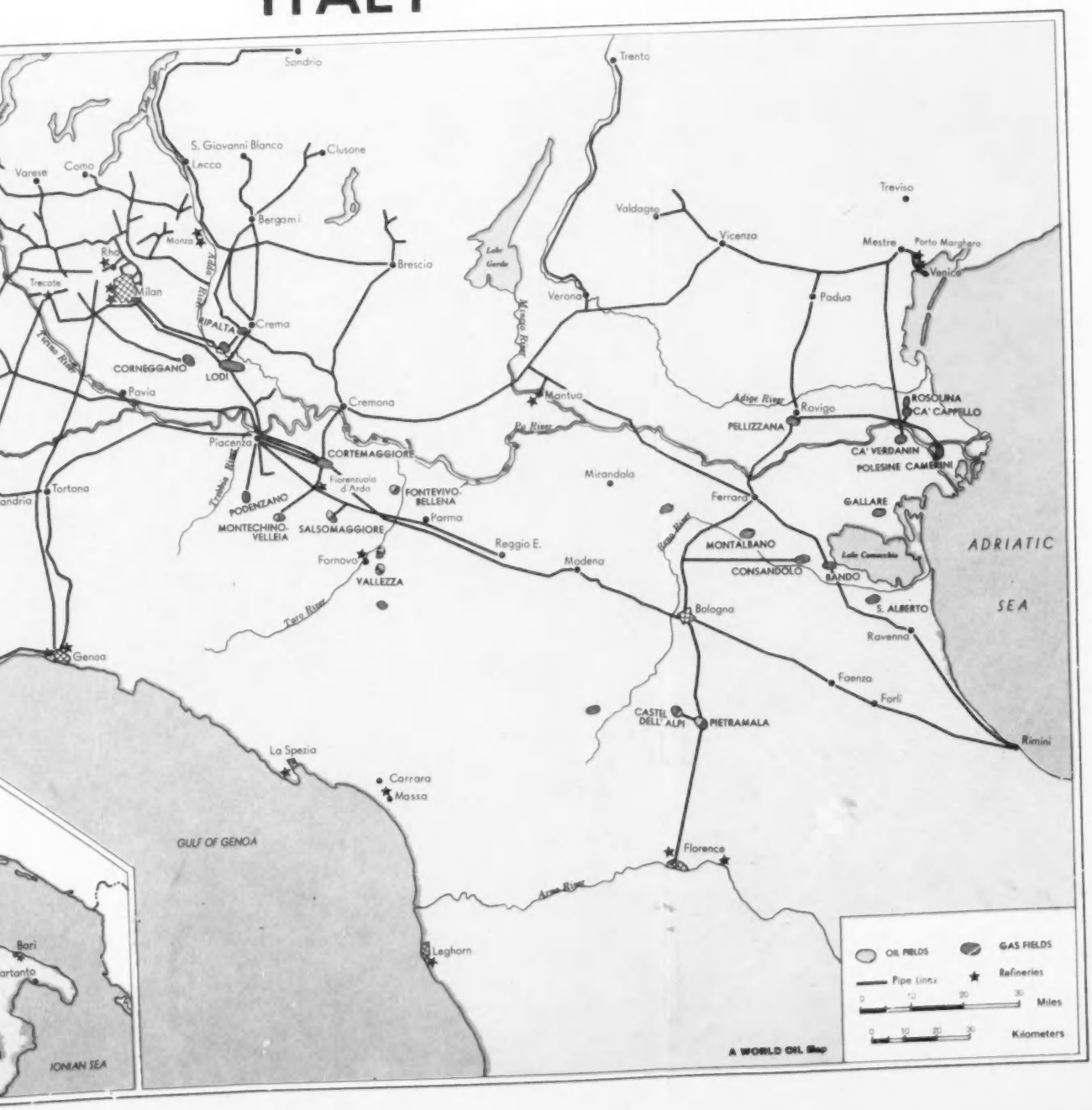
ITALY


Sondrio
Trento
S. Giovanni Bianco
Clusone
Lecco
Como
Varese
Bergamo
Brescia
Monza
Rho
Trecate
Milan
Adda River
RIPALTA
Crema
Lake Garda
Mincio River
Verona
Valdagno
Vicenza
Treviso
Mestre
Porto Marghera
Venice
Padua
Lambro River
CORNEGGIANO
LODI
Pavia
Cremona
Mantua
Adige River
Rovigo
ROSOLINA
CA' CAPPELLO
PELLIZZANA
CA' VERDANIN
POLESINE CAMERINI
Piacenza
CORTEMAGGIORE
Po River
Mirandola
Tortona
Trebbia River
Fiorenzuola d'Arda
FONTEVIVO-BELLENA
PODENZANO
MONTECHINO-VELLEIA
SALSOMAGGIORE
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Ferrara
GALLARE
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Lake Comacchio
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Forlì
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Rimini
La Spezia
Carrara
Massa
GULF OF GENOA
Florence
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OIL FIELDS
GAS FIELDS
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Refineries
Miles
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A WORLD OIL Map

WORLD CRUDE RESERVES

Estimated World Oil Reserves Pass 100-Billion Barrel Mark; U. S. Moves Steadily Toward Danger of Diminishing Reserves

COMPLETING another 12 months of increasing oil production in 1951, the U. S., world's No. 1 petroleum producer, continued moving steadily toward the danger of diminishing reserves. Production in 1951 rose to 2,244,404,000 barrels—52.51 percent of the world's yield. At that rate and without the discovery of new oil, the U. S. had a ratio of reserves to production of only 11.7 years. That ratio was tantamount to a drop from 1950 of 1.6 years. In 1950, annual production of 1,971,845,000 barrels, 52.12 percent of the world output, allowed a ratio of reserves to production of 13.3 years.

In other words, unless new oil is discovered, U. S. reserves will supply requirements at the 1951 rate for less than 12 years. This became evident at the close of 1951, despite the growth of estimated proven reserves from 26,217,724,000 barrels in 1950 to 26,308,610,000 barrels in 1951. But along with the slight increase in reserves went a greater increase in producing rate. On Jan. 1, 1946, the estimated reserves in the U. S. of 20,826,813,000 barrels was equal to 30.90 percent of the world reserve figure.

Total world reserves as of Jan. 1, 1952, of 100,477,560,000 barrels reflected an increase from the same period the year before of 5,269,436,000 barrels. In 1946, total world reserves were put at 76,411,813,000 barrels.

From Jan. 1, 1946, to Jan. 1, 1952, Canada's estimated

Five-Year Comparison of Estimated World Crude Reserves, by Countries

(THOUSANDS OF BARRELS)

CONTINENT and COUNTRY	ESTIMATED RESERVES				ANNUAL PRODUCTION		Ratio of Reserves to Annual Prod. (Years' Supply)
	Thousand Barrels Jan. 1, 1946	Percent of World	Thousand Barrels Jan. 1, 1952	Percent of World	Thousand Barrels in 1951	Percent of World	
North America	**21,849,803**	**32.41**	**29,089,110**	**28.95**	**2,368,723**	**55.41**	**12.3**
Alaska	.....	.....	500	.....	.....	.....	.....
Canada	15,000	0.22	1,400,000	1.39	47,112	1.10	29.7
Cuba	3,000	.....	2,000	.....	118	0.00	16.9
Mexico	870,000	1.29	1,378,000	1.37	77,089	1.80	17.9
*United States	20,826,813	30.90	26,308,610	26.19	2,244,404	52.51	11.7
South America	**8,336,000**	**12.37**	**11,220,000**	**11.17**	**726,127**	**16.99**	**15.5**
Argentina	300,000	0.45	300,000	0.30	24,407	0.57	12.3
Bolivia	50,000	0.07	10,000	0.01	514	0.01	19.5
Brazil	1,000	.....	25,000	0.03	756	0.02	33.1
Chile	.....	.....	30,000	0.03	759	0.02	39.5
Colombia	500,000	0.74	400,000	0.40	38,148	0.89	10.5
Ecuador	25,000	0.04	30,000	0.03	2,715	0.06	11.0
Peru	160,000	0.24	175,000	0.17	16,109	0.38	10.9
Trinidad	300,000	0.45	250,000	0.25	20,532	0.48	12.2
Venezuela	7,000,000	10.38	10,000,000	9.95	622,187	14.56	16.1
Europe	**8,840,150**	**13.11**	**6,375,800**	**6.34**	**356,268**	**8.33**	**17.9**
Albania	25,000	0.04	21,000	0.02	2,401	0.06	8.7
Austria	75,000	0.11	135,000	0.14	15,010	0.35	9.0
Czechoslovakia	3,500	0.01	2,500	.....	350	0.01	7.1
France	10,000	0.01	30,000	0.03	2,117	0.05	14.2
Germany	85,000	0.13	250,000	0.25	9,566	0.23	26.1
Great Britain	15,000	0.02	3,300	.....	335	0.01	9.9
Hungary	75,000	0.11	30,000	0.03	4,500	0.11	6.7
Italy	1,500	.....	3,000	.....	72	.....	41.7
Netherlands	.....	.....	50,000	0.05	4,964	0.12	10.1
Poland	50,000	0.07	11,000	0.01	1,298	0.03	8.5
Roumania	500,000	0.74	335,000	0.33	27,000	0.63	12.4
U.S.S.R. (Russia)	8,000,000	11.87	5,500,000	5.47	287,500	6.73	19.1
Yugoslavia	150	.....	5,000	0.01	1,155	0.02	4.3
Africa	**75,500**	**0.11**	**169,050**	**0.17**	**16,959**	**0.40**	**10.0**
Algeria	500	.....	50	.....	101	0.00	0.5
Egypt	75,000	0.11	164,000	0.16	16,299	0.39	10.1
Morocco	.....	.....	5,000	0.01	559	0.01	8.9
Asia, Total	**28,310,000**	**42.000**	**53,623,500**	**53.37**	**809,242**	**18.92**	**66.3**
Asia, Middle East	**27,000,000**	**40.05**	**51,825,000**	**51.58**	**702,314**	**16.43**	**73.8**
Bahrain	250,000	0.37	300,000	0.30	10,994	0.26	27.3
Iran (Persia)	7,000,000	10.38	13,000,000	12.94	128,503	3.01	101.2
Iraq	5,000,000	7.42	10,500,000	10.45	61,534	1.44	170.6
Kuwait	9,000,000	13.35	16,000,000	15.92	205,127	4.80	78.0
Qatar	1,000,000	1.48	1,000,000	1.00	18,097	0.42	55.3
Saudi Arabia	4,750,000	7.05	11,000,000	10.95	277,962	6.50	39.6
Turkey	.....	.....	25,000	0.02	97	0.00	257.7
Asia, Far East	**1,310,000**	**1.95**	**1,798,500**	**1.79**	**106,928**	**2.49**	**16.9**
Borneo, British (Sarawak and Brunei)	75,000	0.11	500,000	0.50	37,468	0.88	13.3
Burma	100,000	0.15	48,000	0.05	644	0.02	74.5
China	15,000	0.02	10,000	0.01	728	0.02	13.7
Formosa	.....	.....	500	.....	24	0.00	20.8
India	35,000	0.05	25,000	0.02	1,900	0.03	17.9
Indonesia	1,000,000	1.49	1,100,000	1.10	55,353	1.29	19.9
Japan	35,000	0.05	30,000	0.03	2,306	0.06	13.0
Pakistan	.....	.....	20,000	0.02	1,505	0.03	13.3
Sakhalin	50,000	0.08	65,000	0.06	7,000	0.16	9.3
Australia-New Zealand	**100**	.....	**100**	.....	**1**	**0.00**	**100.0**
World, Undistributed	**250**	.....	.....	.....	.....	.....	.....
TOTAL WORLD	**76,411,813**	**100.00**	**100,477,560**	**100.00**	**4,277,320**	**100.00**	**23.5**

* U.S. crude oil only; not including natural gas liquids.

reserves rose from 15 million barrels, or 0.22 percent of the world total, to 1,400,000,000, or 1.39 percent of the world figure. Canada's ratio of reserves to annual production amounted to 29.7 years in 1951. However, both Canada's production and reserves were expected to climb sharply in 1952 as widespread drilling continued.

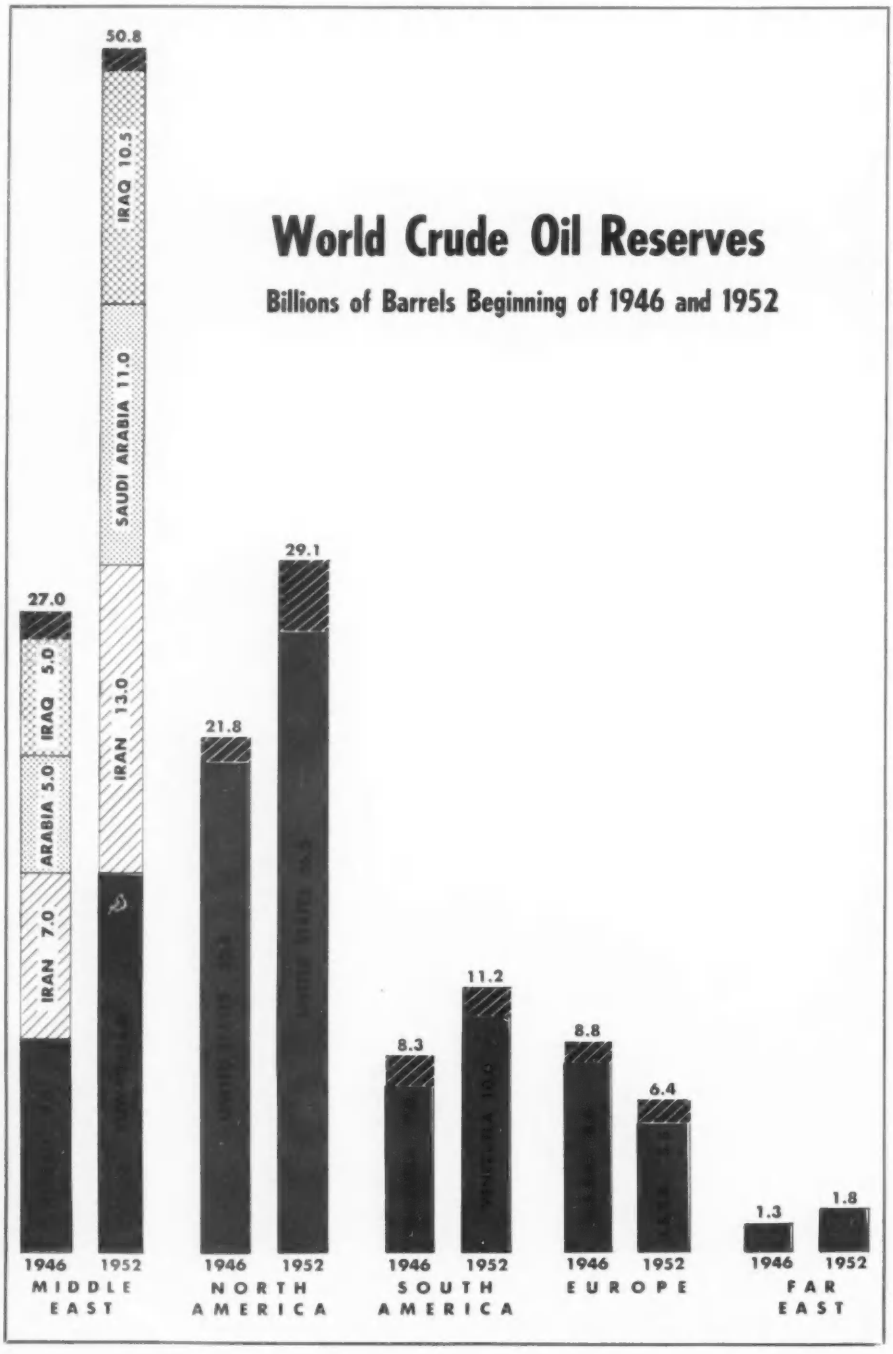
Mexico's reserve figure rose 78 million barrels from 1950 to 1,378,000,000 barrels. Production there during the year of 77,089,000 barrels will allow a continuance of that rate for 17.9 years.

Therefore, the estimated crude reserves of North America will allow an annual production at the rate of 1951's 2,368,723 barrels for 12.3 years.

South America, with an oil yield of 726,127,000 barrels in 1951, has reserves which will allow that production rate to continue for 15.5 years. Venezuela is responsible for a lion's share of this ratio of reserves to annual production, with a 10-billion-barrel estimated reserve as of Jan. 1, 1952, and a 1951 annual production of 622,187,000 barrels—good for 16.1 years if that output rate remains constant in the absence of new oil discoveries.

With 400 million barrels of reserves, Colombia produced in 1951 at a rate of 38,148,000 barrels. The country's current reserves will allow the 1951 output rate to continue for 10.5 years. Argentina, under the iron hand of a dictator, serves as an example of what can happen to an industry when government places itself at the helm. Argentina's estimated reserves as of Jan. 1, 1952, were 300 million barrels, a figure identical with that of Jan. 1, 1946.

Europe's reserve picture darkened slightly during 1951, as production rose from 322,241,000 barrels in 1950 to 354,202,000 barrels in 1951. As of Jan. 1, 1952, estimated European reserves were 6,375,800,000 barrels. A year previous, reserves were put at 6,206,700,000 barrels. Under the 1951 production rate, Europe's reserves were calculated to last for 18 years.



Total Asian reserves of 53,623,500,000 barrels as of January 1, 1952, amounted to 53.37 percent of the world total. Based upon 1951 production rate of 809,242,000 barrels, the reserves may be expected to last for 66.3 years. Middle Eastern reserves, which climbed from 27 billion barrels in 1946 to 51,825,000,000 barrels as of Jan. 1, 1952, were equal to slightly more than 50 percent of world reserves. At an output rate of 1951's 702,314,000 barrels, the ratio of Middle East reserves to annual production was 73.8 years.

Far Eastern reserves as of Jan. 1, 1952, were 1,798,500,000 barrels, up from 1,310,000,000 barrels in 1946. On the basis of annual production of 106,928,000 barrels, as yielded in 1951, the Far East reserves were good for 16.9 years.

Middle Eastern reserves were built up largely by Kuwait, with 16 billion barrels; Iran, with 13 billion barrels; Saudi Arabia, with 11 billion barrels; and Iraq, with 10½ billion barrels. Qatar with 1 billion barrels. Bahrain with 300 million barrels and Turkey with 25 million barrels followed in that order.

Kuwait reserves climbed 7 billion barrels from 1946, and, with 1951's annual production rate of 205,127,000 barrels as a yardstick, have a ratio to annual production of 78 years. Turkey's greatly less reserve figure has a ratio of 257.7 years; however, the very high ratio results from low production of 97,000 barrels for 1951.

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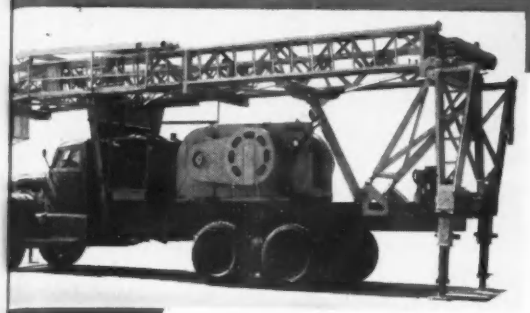
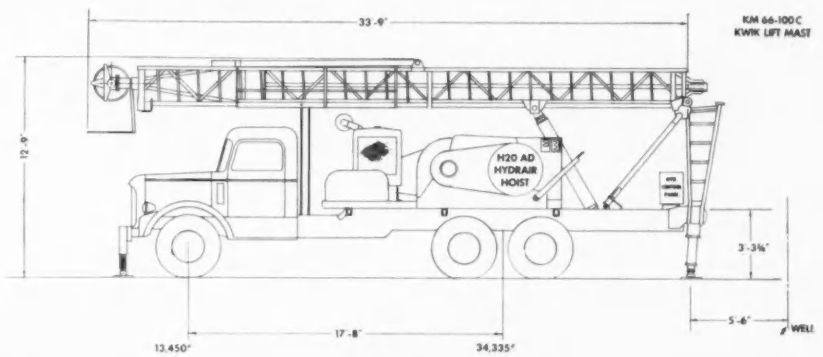
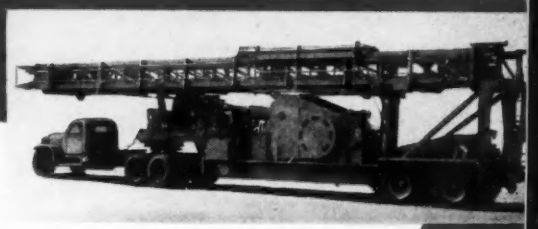
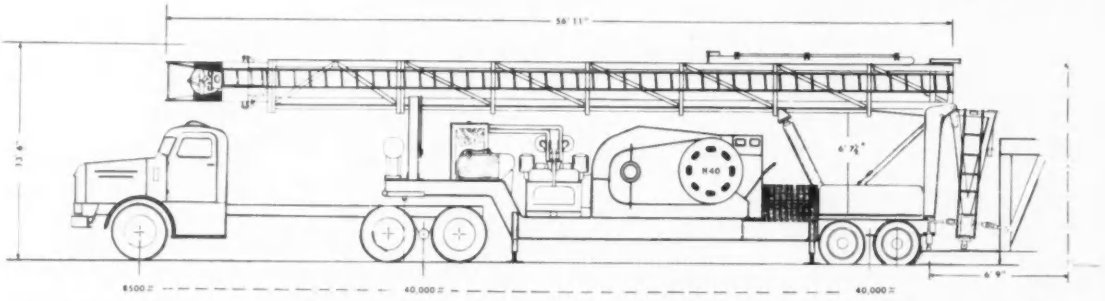




H-20-A Rambler Rig for servicing with KM 66-100-C Kwik-Lift Mast.





H-40-D Rambler Rig for drilling, workover and servicing with KM-103-250 Kwik-Lift Mast.

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WORLD COMPLETIONS and FOOTAGE

More Wells Completed and More Footage Drilled During 1951 But Fewer Efforts Find Oil and Failures Show Marked Rise

MORE wells were completed and more footage was drilled during 1951 than in 1950 by comfortable margins. Likewise, more wells were drilling at the end of 1951 than at the same period the previous year.

In 1951 a total of 48,222 wells were finaled, up 688 wells from 1950, when 47,534 were completed. A better gauge of drilling activity, footage drilled, rose 14,644,945 feet from the 1950 figure of 173,100,857 feet to 187,745,802 feet. This was 35,503,079 feet more than during 1949. At the close of 1951, 5542 wells were drilling, as compared to 4941 the year previous.

Of the wells completed during the year, 26,111 found oil, 3422 discovered gas and 18,353 were dry holes. These figures reflect a slight decline from 1950's successful oil completions—26,295; an increase from 1950's gas wells—3302; and a marked rise in failures from 1950's total of 15,772.

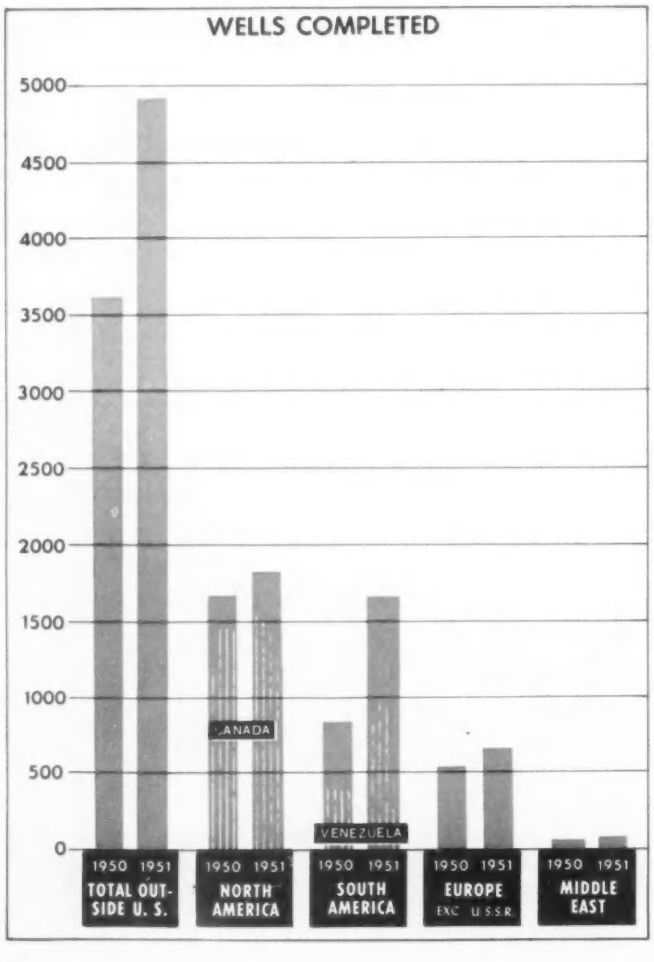
The U. S. accounted for 43,299 completions, with combined footage of 169,029,453 feet. Results of this drilling activity led to 23,179 oil wells, 3094 gassers and 17,026 dry holes. At year's end, 5182 wells were drilling, as compared with 4941 at the same time a year previous.

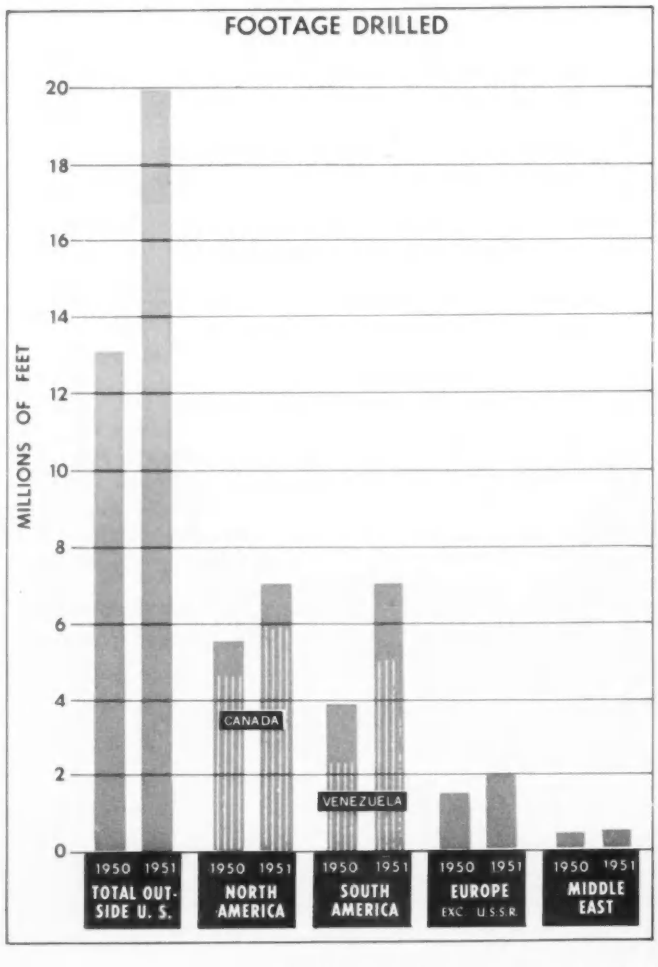
The Western Hemisphere easily led in the year's drilling activity. Outside the U. S., Canada again played a major role, with the completion of 1544 wells for total footage of 5,815,870 feet. This 1,187,807-foot increase from 1950 was built on 755 oil wells, 262 gassers and 527 dry holes.

Following close on Canada's heels, Venezuela led all other South American countries with its footage of 5,432,680 feet, a decided rise from 2,229,098 feet in 1950. During 1951, 1206 wells were completed—1056 oil wells, eight gas wells and 140 dry holes. Ninety-eight wells were drilling there at the close of the year.

After a year of intense exploration and exploitation

Drilling Activity Outside of U. S. in 1950-51





WHAT'S YOUR PRODUCING PROBLEM?

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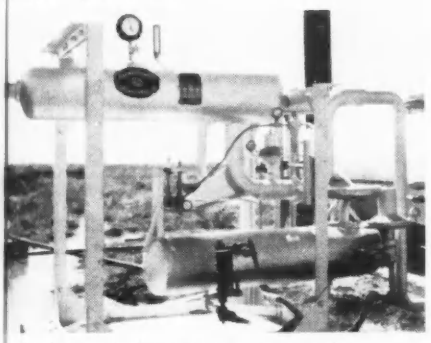
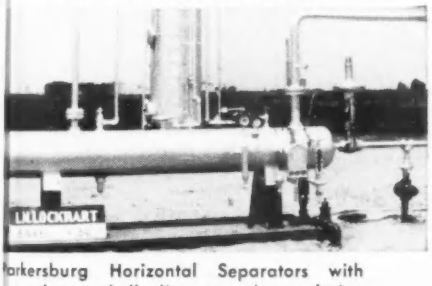


arkersburg Hydracepter recovers free ater and liquid hydrocarbons from gas nes, thus preventing freezing problems nd increasing condensate recovery.



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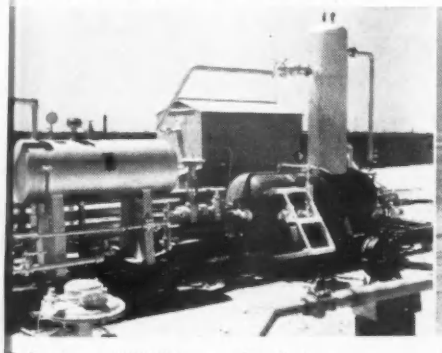

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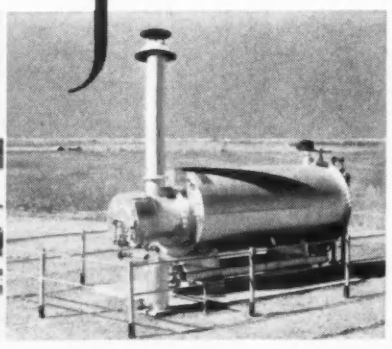

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efforts, Germany assumed the major role in European drilling. Its total of 1,111,294 feet of drilling resulted in 260 oil wells, two gassers and 132 abandonments. Seventy-five wells were drilling at year's end. In 1950, 343 wells were drilled with a total footage of 922,721 feet. Thirty-four wells were in operation at the close of 1950.

Morocco accounted for more than 50 percent of Africa's drilling activities for 1951. Of Africa's total of 56 oil wells, one gasser and 108 failures and footage of 593,381 feet, Morocco reported 24 oil wells, 76 dry holes and footage of 409,759 feet.

Middle East drilling activities rose, too. From a total drilling footage of 475,547 feet and 74 completions in 1950, Bahrain Island, Iran, Iraq, Kuwait, Qatar, Saudi Arabia and Turkey combined in 1951 to roll up 494,002 feet of drilling. Results were 84 oil wells and eight failures.

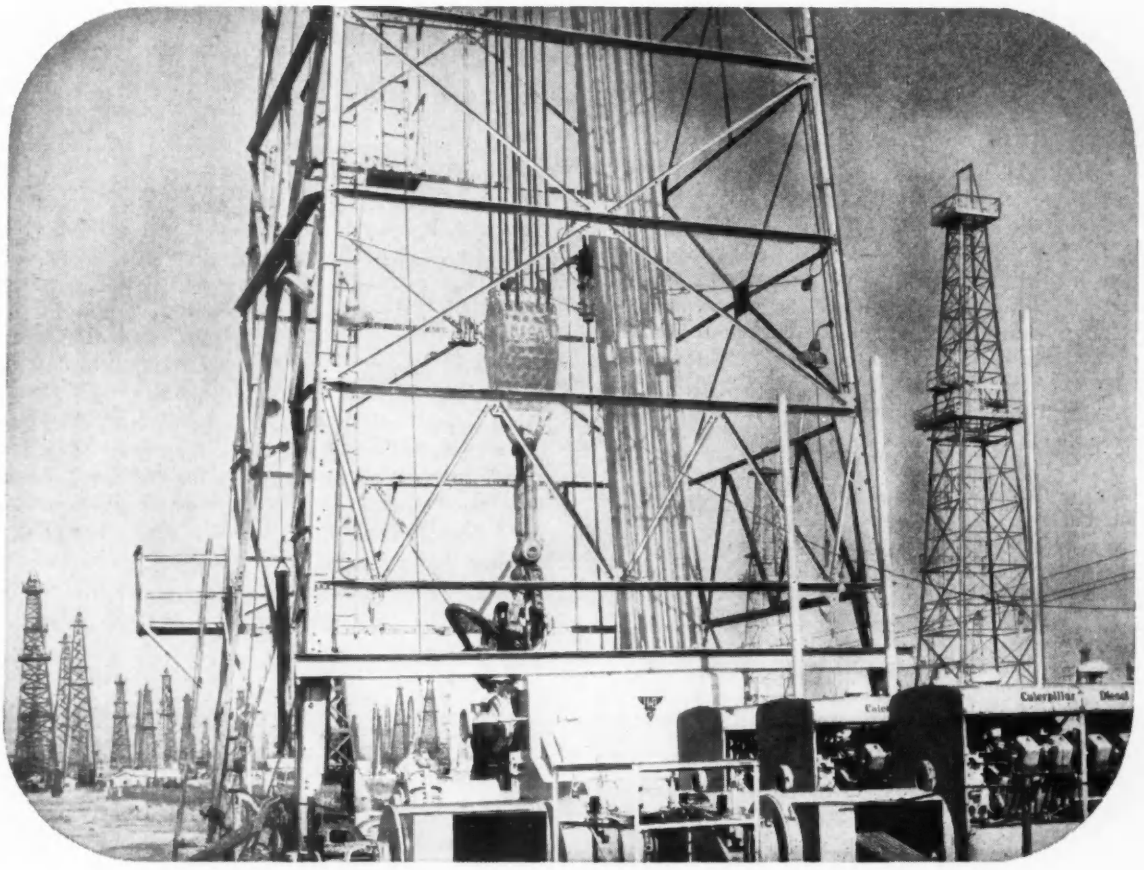
Total Far Eastern drilling activities recorded sizable increases in all departments. Footage drilled in 1951 amounted to an increase of 324,911 feet from 1950 footage of 782,062 feet. Four-hundred-and-one wells were drilled.

Drilling Activity in 1950 and 1951 by Countries

COUNTRY	Total Wells Completed in 1950	Footage Drilled in 1950 Completions	Wells Drilling End of 1950	WELLS COMPLETED IN 1951					Wells Drilling End of 1951
				Oil	Gas	Dry	TOTAL Wells	TOTAL Footage	
NORTH AMERICA, Except United States:									
Alaska	12	32,892	4	3	3	14	20	57,116	2
Canada	1,443	4,628,604	n.a.	755	262	527	1,544	5,815,870	n.a.
Mexico	215	904,023	66	122	13	133	268	1,061,950	48
Total North America, Except United States	1,670	5,565,519	70	880	278	674	1,832	6,934,936	50
WEST INDIES:									
Cuba	.....	.....	.....	.....	.....	1	1	11,218	1
Trinidad	144	604,019	23	129	1	12	142	637,938	23
SOUTH AMERICA:									
Argentina	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Bolivia	5	16,500	4	3	.....	.....	3	n.a.	n.a.
Brazil	30	70,934	4	n.a.	n.a.	n.a.	n.a.	85,498	n.a.
Chile	15	14,100	4	31	15	11	57	n.a.	5
Colombia	104	487,607	n.a.	n.a.	n.a.	n.a.	100	465,351	n.a.
Ecuador	77	317,348	13	54	.....	.....	54	192,468	0
Peru	198	660,478	32	131	.....	89	220	843,188	29
Venezuela	393	2,229,098	n.a.	1,056	8	140	1,206	[7]5,432,680	98
Total South America	822	3,796,065	57	1,275	23	240	1,640	7,019,185	132
EUROPE:									
Albania	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Austria	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Czechoslovakia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Denmark	2	9,314	1	.....	.....	1	[3]1	10,247	n.a.
France	113	348,600	14	57	.....	119	176	474,100	22
Germany	343	922,721	34	260	2	132	394	1,111,294	75
Great Britain	2	8,370	n.a.	.....	.....	1	1	4,353	n.a.
Hungary	n.a.	n.a.	n.a.	12	.....	.....	12	86,975	n.a.
Italy	37	134,249	7	2	22	5	29	109,163	7
Netherlands	23	62,800	n.a.	29	.....	4	33	104,134	1
Poland	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Roumania	n.a.	n.a.	n.a.	[2]2	n.a.	n.a.	n.a.	n.a.	n.a.
U.S.S.R.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Yugoslavia	n.a.	n.a.	n.a.	3	.....	.....	3	18,450	n.a.
Total Europe	520	1,486,054	56	365	24	262	649	1,918,716	105
AFRICA:									
Algeria	25	81,800	2	28	1	24	53	142,010	5
Egypt	20	64,964	n.a.	4	.....	8	12	41,612	[3]3
Morocco	75	262,800	9	24	.....	76	100	409,759	5
Other Africa	1	10,000	n.a.	.....	.....	.....	.....	.....	1
Total Africa	121	419,564	11	56	1	108	165	593,381	14
MIDDLE EAST:									
Bahrain Island	4	9,711	1	6	.....	2	8	20,430	1
Iran	8	84,020	11	7	.....	1	8	n.a.	n.a.
Iraq	18	109,286	6	14	.....	.....	[4]14	123,635	7
Kuwait	13	61,188	3	20	.....	1	21	89,985	3
Qatar	5	41,647	3	5	.....	.....	[6]6	44,173	3
Saudi Arabia	21	143,647	5	31	.....	1	32	215,779	9
Turkey	5	26,048	.....	1	.....	3	4	n.a.	1
Total Middle East	74	475,547	29	84	.....	8	93	494,002	24
FAR EAST:									
British Borneo	13	88,894	n.a.	29	.....	2	31	185,099	4
China (including Formosa)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
India and Pakistan	2	21,603	n.a.	1	.....	.....	1	8,610	3
Japan	162	301,118	n.a.	n.a.	n.a.	n.a.	235	400,834	n.a.
Indonesia	88	346,030	28	111	1	19	131	493,495	12
Papua	2	10,077	2	2	.....	1	3	[5]18,935	n.a.
Philippines	3	14,338	.....	.....	.....	.....	.....	.....	.....
Total Far East	270	782,062	30	143	1	22	401	1,106,973	19
OCEANIA:									
Australia	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Zealand	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total Outside United States	**3,621**	**13,128,830**	**276**	**2,932**	**328**	**1,327**	**4,923**	**18,716 349**	**368**
UNITED STATES	43,913	159,972,027	4,665	23,179	3,094	17,026	43,299	169,029,453	5,182
WORLD TOTAL	**47,534**	**173,100,857**	**4,941**	**26,111**	**3,422**	**18,353**	[1]**48,222**	**187,745,802**	**5,542**

[1] Total includes 336 wells not listed as oil, gas or dry. [2] Seventeen wells were being drilled, but no further information was available. [3] Additional testing pending. [4] Includes one observation well. [5] Footage for the dry hole not included. [6] All drilling operations suspended at end of March, 1952. [7] Includes footage drilled in wells not completed at the end of the year.

WIRE ROPE



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WORLD PRODUCING WELLS

Number of Producers Increases to 510,500 at End of 1951 To Boost Daily Average Yield to 11,968,645 Barrels

AT YEAR'S end, total world producing oil wells numbered approximately 510,500, or about 10,500 more than at the close of 1950. This increase in producers resulted in a rise in the world's daily average yield to 11,968,645 barrels, up 1,037,535 barrels from the previous year.

Again in 1951, political factors allowed but a carefully gauged estimate on activities for some areas. WORLD OIL estimates are based on information received from private sources from within those areas.

The U. S., as the world's major producing area, showed a gain of 12,787 producing wells at the close of 1951 from the previous year, when its producers totaled 466,308. Consequently, the nation's average daily production grew from 5,641,300 barrels in 1950 to 6,120,850 barrels, up 479,550 barrels or 8.5 percent. Of the U. S. producing wells, 11.5 percent were flowing.

Canada reported an increase of producing wells from the previous year of 538—to 4007 wells. And daily average production changed from 83,727 barrels in 1950 to 122,611 barrels in 1951.

While Mexico's total number of producing wells rose from 1215 in 1950 to 1270 in 1951, daily average production climbed 69 barrels. And 98 more producing wells at the close of the year, as compared with 1950, failed to prevent a slump in Trinidad's daily average production of 597 barrels.

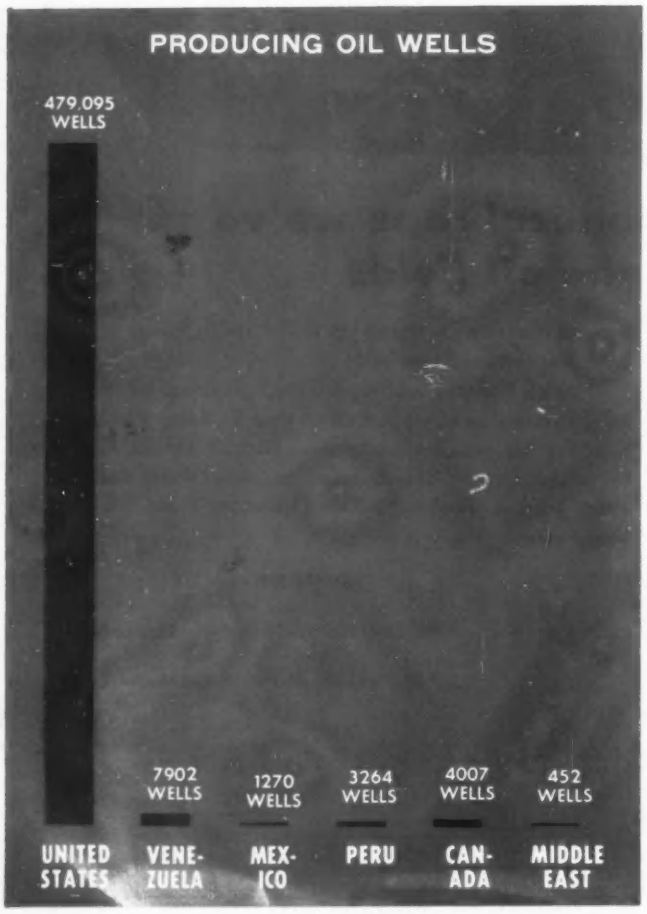
South America followed the U. S. and reported the second largest increase in daily average production, registering 1,999,472 barrels—191,497 barrels more than at the close of the previous year. At the close of 1950, 13,151 wells were producing; as 1951 closed, 13,655 were reported in production. However, this 504-well increase does not include the number of producing wells in Argentina and Brazil.

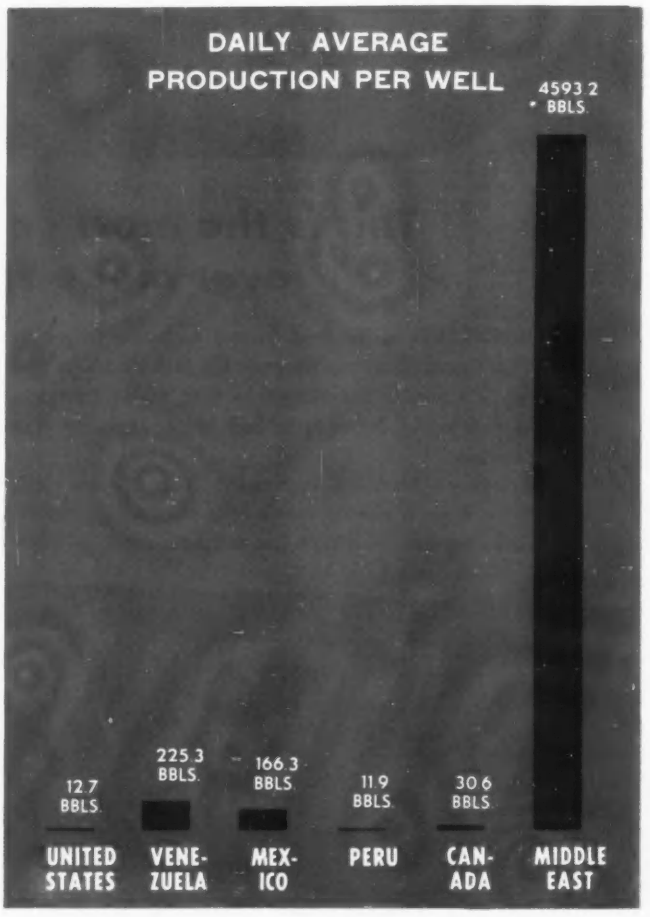
Europe, with the third largest daily average yield increase, produced an average of 1,046,676 barrels daily, 168,718 barrels a day more than during the previous year. With producing well figures available from only five of 13 European oil-producing nations for both 1950 and 1951, an increase of 666 producing wells was tabulated. In the previous year, 3340 wells from five countries were tabulated.

Africa, with 74 more producing wells at the end of 1951 that at the same time the previous year, accounted for 2134 barrels daily more than in 1950. In 1950, 178 producing wells reached daily average production at year's end of 45,909 barrels.

Daily average production from the Middle Eastern

Producing Oil Wells and Daily Output of Principal Areas, End of 1951





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Lane-Wells Better Perforating. Pioneered in 1932, continuously developed through all the twenty years since, Lane-Wells perforating gives you the unrivalled combination of depth measurements famous for their accuracy, deeper penetration with such developments as the A-2 Gun, bullets and guns in sizes and types to meet exactly the requirements of every job, the perfect control afforded by selective firing, plus maximum safety for both property and personnel. And all of this is administered by men completely familiar with your local conditions.

Lane-Wells Koneshot. This younger companion of Lane-Wells bullet perforating is already widely known as the "plus-value" perforating because it gives you, in addition to the deep penetration of all shaped-charge perforating, all the other advantages of Lane-Wells service – the accurate depth measurements, the accumulated experience of twenty years of down-hole work, the close knowledge of your particular well conditions, the rigid safety precautions which guard both the well and the men.

Lane-Wells Radioactivity Well Logging. This logging method – the only one which can "see" formations through casing – is credited with locating millions of dollars in cased-off production. With a Lane-Wells combination Radioactivity Well Log – the Gamma Ray identifying the types and extent of the formations traversed by the well-bore, the Neuton Curve pointing out fluid-bearing formations, and the Collar Log tying all the information to a series of immovable 'bench-marks'– the operator has a complete picture of his well to guide him in making the best possible completion.

Lane-Wells Engineered Packer Service. This all-inclusive term covers two separate endeavors – one, the free advisory service available to any operator on request; two, the constant engineering work through more than two decades devoted to improvement in Lane-Wells Packers themselves. Both have been successful . . . many advances have been made in the engineering of the packers; many operators have expressed their appreciation of the engineered answers which have aided them in meeting packer problems.

Lane-Wells Drillable Bridging Plugs. In dozens of different oil field applications these positive, leakproof plugs have been outstandingly successful . . . false bottoms for tail-pipe packers, multiple-zone testing, tamping and confirming nitro shots, upper zone completions, squeeze jobs, abandonments. Run either on tubing or wire line, they will outlast the casing in permanent installations, but are easily drilled up or knocked down with either rotary or cable tools in four to six hours.

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countries and total number of operating wells during the year were:

Bahrain Island, 30,000 barrels and 72 wells; Iran, 355,000 barrels, 87 wells; Iraq, 171,097 barrels, 74 wells; Kuwait, 700,000 barrels, 118 wells, Qatar, 58,000 barrels, 21 wells; Saudi Arabia, 761,541 barrels from 118 wells; and Turkey, 500 barrels from its four pumping wells.

Total Middle East daily average production during 1951 of 2,076,138 barrels, 103,556 barrels up from 1950, was yielded by 452 wells—109 more than were producing at the close of the previous year. It is significant to note that an average of 4,593 barrels of crude was produced daily by each well in the Middle East. In the U. S., for comparison, an average of 12.7 barrels was produced daily by each well.

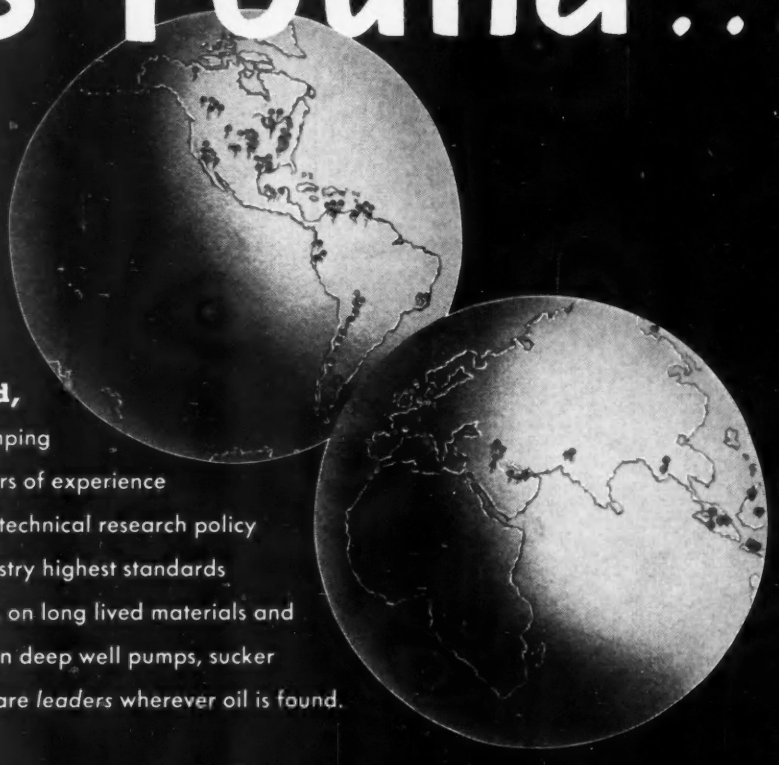
Daily average production in the Far East rose 53,901 barrels from the close of the previous year. In 1951 British Borneo (Sarawak and Brunei), produced an average of 102,274 barrels daily from 301 wells; Burma, 2,000 barrels; China and Formosa, 1995 barrels; India and Pakistan, 8385 barrels; Japan, 5724 barrels, and Indonesia, 166,763 barrels a day.

Producing Oil Wells and Daily Production, 1950 and 1951, by Countries

COUNTRY	Total Producing Oil Wells End of 1950	Daily Average Production End of 1950	PRODUCING OIL WELLS AND THEIR OUTPUT AT END OF 1951				
			Flowing	Artificial Lift	Total Producing	Daily Average Production	Barrels Daily Per Well
NORTH AMERICA, Except United States:							
Canada	3,469	83,727	n.a.	n.a.	4,007	122,611	30.6
Mexico	1,215	211,137	n.a.	n.a.	1,270	211,206	166.3
Total North America, Outside United States	4,684	294,864	.....	.....	5,277	333,817	63.3
WEST INDIES:							
Cuba	n.a.	500	n.a.	n.a.	n.a.	323	.....
Trinidad	2,053	56,777	510	1,632	2,151	56,180	26.1
Total West Indies	.....	57,277	.....	.....	.....	56,503	.....
SOUTH AMERICA:							
Argentina	n.a.	61,890	n.a.	n.a.	n.a.	66,902	.....
Bolivia	32	1,708	n.a.	n.a.	3	200	66.7
Brazil	114	2,965	n.a.	n.a.	n.a.	1,800	.....
Chile	20	1,885	10	.....	10	2,315	231.5
Colombia	1,312	103,226	157	251	1,450	101,909	70.3
Ecuador	1,060	7,373	n.a.	n.a.	1,026	7,469	7.3
Peru	3,698	41,172	125	3,139	3,264	38,877	11.9
Venezuela	6,915	1,649,646	3,180	4,722	7,902	1,780,000	225.3
Total South America	13,151	1,807,975	.....	.....	.....	1,999,472	.....
EUROPE:							
Albania	n.a.	5,700	n.a.	n.a.	n.a.	6,600	.....
Austria	n.a.	16,900	n.a.	n.a.	n.a.	41,000	45.6
Czechoslovakia	n.a.	1,000	n.a.	n.a.	n.a.	1,000	.....
France	699	4,000	20	565	585	6,025	10.3
Germany	1,991	23,272	139	1,682	2,147	28,518	13.3
Great Britain	232	838	.....	231	231	1,073	4.6
Hungary	n.a.	12,000	n.a.	n.a.	n.a.	12,000	.....
Italy	312	218	n.a.	n.a.	n.a.	72,180	.....
Netherlands	106	14,190	n.a.	n.a.	143	11,680	.....
Poland	n.a.	2,540	n.a.	n.a.	n.a.	3,500	.....
Roumania	n.a.	75,000	n.a.	n.a.	n.a.	73,000	.....
U. S. S. R. (Including Sakhalin)	n.a.	721,000	n.a.	n.a.	n.a.	787,000	.....
Yugoslavia	n.a.	1,300	n.a.	n.a.	n.a.	3,100	.....
Total Europe	.....	877,958	.....	.....	.....	1,046,676	.....
AFRICA:							
Algeria	15	180	n.a.	n.a.	40	270	6.8
Egypt	110‡	44,589	26	119	145	45,953	316.9
Morocco	53	1,140	47	20	67	1,820	27.2
Total Africa	178	45,909	.....	.....	252	48,043	190.6
MIDDLE EAST:							
Bahrain Island	69	30,180	n.a.	n.a.	72	30,000	416.7
Iran	77	718,000	n.a.	n.a.	87	355,000	4,080.5
Iraq	11	158,909	23	.....	74	171,097	5,346.8
Kuwait	78	403,369	118	.....	118	700,000	5,932.2
Qatar	10	43,750	16	.....	21	58,000	2,761.9
Saudi Arabia	95	617,872	118	.....	118	761,541	6,453.7
Turkey	3	502	.....	4	4	500	125.0
Total Middle East	343	1,972,582	.....	.....	452	2,076,138	4,593.2
FAR EAST:							
British Borneo (Sarawak and Brunei)	268‡	81,370	95	206	301	102,274	339.8
Burma	n.a.	1,500	n.a.	n.a.	n.a.	2,000	.....
China and Formosa	n.a.	2,200	n.a.	n.a.	n.a.	1,995	.....
India and Pakistan	n.a.	8,350	n.a.	n.a.	n.a.	8,385	.....
Japan	3,241	5,905	n.a.	n.a.	3,507	5,724	1.6
Indonesia	1,629	133,915	571	1,198	1,771	166,763	94.2
Total Far East	.....	233,240	.....	.....	.....	287,141	.....
OCEANIA:							
Australia	n.a.	5	n.a.	n.a.	n.a.	5	.....
Total Oceania	.....	5	.....	.....	.....	5	.....
Total Outside United States	.....	5,280,800	.....	.....	.....	5,847,795	.....
UNITED STATES	466,308	5,641,300	55,548	423,547	479,095	6,120,850	12.7
TOTAL WORLD	.....	10,953,410	.....	.....	.....	11,968,645	.....

‡ Estimated. n.a.—Not available.

Wherever Oil is Found.....



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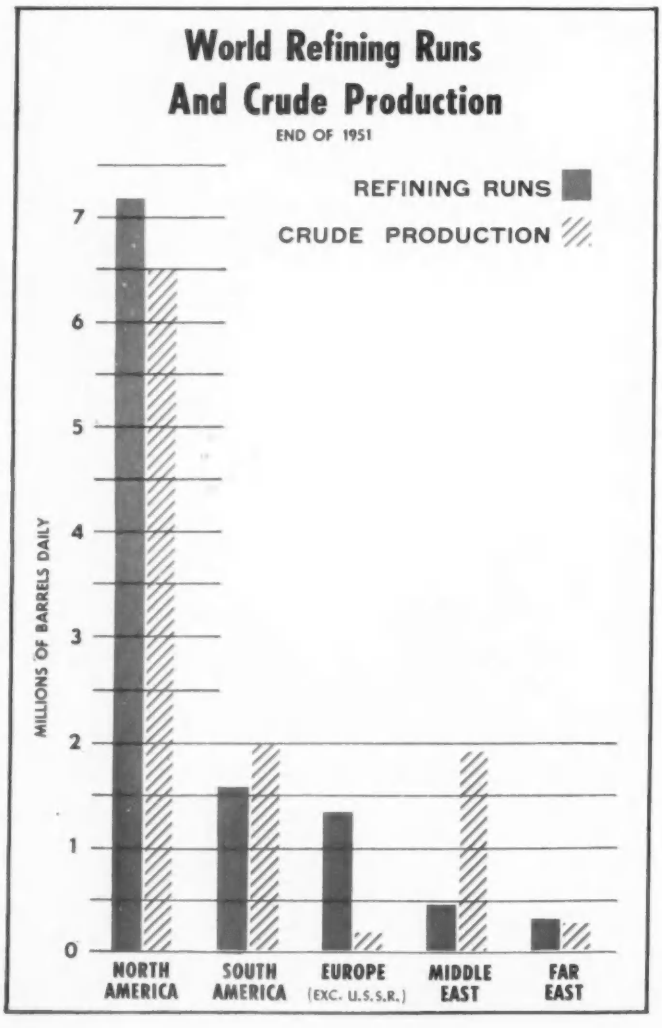
WORLD REFINING

Daily Runs to 722 Refineries Rise 824,291 Barrels; U. S. Reports Increase of 502,710 Barrels Over 1950

DAILY crude runs to the world's 722 operating refineries in 1951 reached 11,871,099 barrels at the close of the year, up 824,291 barrels from the previous year. These totals are actual, except for estimates required on refinery operations from within the USSR, satellite Europe and various other countries whose politics and government prevented collection of exact figures. Even with those countries' refining activities, WORLD OIL has been able to make a relatively close approximation on information supplied by its correspondents.

The U. S., continuing as the world's largest refining nation with 338 refineries in operation during the year and daily crude charging capacity of 7,229,000 barrels, was credited with daily crude runs to stills of 6,646,194 barrels, an increase of 502,710 barrels from the previous year. Canada and its burgeoning petroleum industry also reported an increasing trend in refining operations, along with Cuba and Mexico.

Canada's 1951 refinery expansion led to an increase in daily crude runs to stills of almost 50,000 barrels—from 295,032 barrels in 1950 to 343,324 barrels last year. Canada's 45 refineries had a daily crude charging capacity rated at 462,350 barrels in 1951. Cuba's five refineries handled an increase in daily crude runs of 3290 barrels, while Mexico, with 25 refineries operating during the year, reported an increase in crude runs from 142,677 barrels a day in 1950 to 154,516 barrels daily last year.



Every area except the Middle East chalked up an increase in refining operations during 1951. And there, the Iran-Anglo-Iranian Oil Company controversy resulted in the immobilization of the giant refinery at Abadan and in the sharp curtailment of operations. Consequently, Middle East daily crude runs to stills of its dozen refineries which operated at least a part of 1951 slid from 932,387 barrels in 1950 to 458,097 barrels last year—a decrease of 474,290 barrels. Likewise, Israeli refinery operations fell off during 1951. Border difficulties affecting crude receipts were factors in Israel daily crude runs decreasing 2903 barrels daily.

Downward trends in Middle East refining also were noted in Saudi Arabia, where the single refinery at Ras Tanura, on the Persian Gulf, had daily crude runs to stills last year of 151,290 barrels, 6226 barrels a day less than at the close of the previous year. Lebanon's refinery, which recorded daily crude runs of 11,645 barrels in 1950, also dipped slightly—to 11,258 barrels in 1951.

Helping offset these declining crude runs to stills in the Middle East were Iraq's four refineries and Bahrain Island's single installation. Iraq reported an increase of 2322 barrels daily and Bahrain 60,097 barrels per day. Consequently, Bahrain and Iraq, with a total increase in daily crude runs to stills from 1950 of 62,419 barrels, aided in offsetting partially a combined drop of 537,322 barrels reported by Iran, Saudi Arabia, Israel and Lebanon.

Daily crude charging capacity of Middle Eastern refineries is 1,003,250 barrels.

Also offsetting this highly significant decrease in the Middle East were increasing operations in Europe, where the trend toward home refining gained headway.

Refinery expansion in ten Western Europe countries largely offset declines in two others. Belgium, France, Germany, Italy and Trieste, Norway, Portugal, Spain, Sweden and the United Kingdom together reported an increase in daily crude runs to stills at the close of 1951 of 426,643 barrels from the previous year. Denmark and The Netherlands declined a total of 13,516 barrels for the same period.

Therefore, the net increase from the previous year in Western Europe reached a total of 413,127 barrels.

Largest increase in refining operations was reported by the United Kingdom, which has 16 of Western Europe's 112 refineries which operated during 1951. U. K. almost doubled its crude runs to stills with a daily figure at the close of the year of 436,612 barrels. United Kingdom's

refineries have a combined daily crude charging capacity of 539,200 barrels.

France ended the year with Europe's second largest upsweep in daily crude runs to stills—104,515 barrels. Runs in 1950 amounted to 314,517 barrels, and they climbed to 419,032 barrels last year. France's 14 refineries have a daily crude charging capacity of 448,250 barrels.

Belgium, Italy and Trieste followed the increasing trend in that order. Belgium's daily crude runs to stills rose 45,484 barrels, from 7226 barrels in 1950 to 52,710 barrels last year. Italy and Trieste together accounted for but a slightly lower increase of 45,226 barrels—from 126,129 barrels at the close of the previous year to 171,-355 barrels last year. The three Belgium refineries have a combined daily crude charging capacity of 37,300 barrels. The 28 refineries in Italy and Trieste have a total charging capacity of 197,600 barrels daily.

Germany, Norway, Portugal, Spain and Sweden combined to increase their total daily crude runs to stills by 16,451 barrels. Germany's operations rose from 90,323 barrels in 1950 to 94,839 barrels last year; Norway runs increased from 484 barrels to 1032 barrels; Portugal, from 5323 to 8065 barrels; Spain, from 5581 barrels to 9387 barrels; and Sweden from 16,129 barrels to 20,968 barrels.

Total Eastern Europe refining activities reflected a sizeable increase. This trend amounted to a 103,129-barrel increase in daily crude runs to stills, according to WORLD OIL sources. In 1950 daily runs totaled 847,032 barrels; in 1951 the figure rose to 950,161 barrels. USSR accounted for more than two-thirds of this spiral, as its daily runs to stills jumped from 729,032 barrels in 1950 to 804,000 barrels in 1951—up 74,968 barrels daily. Other Eastern Europe countries, all within the limits of the Iron Curtain, marked up a 28,161-barrel hike from 118,-000 barrels in 1950 to 146,161 barrels at the close of 1951.

Eastern Europe's 86 refineries have a total daily crude charging capacity of 1,294,970 barrels. The 27 refineries in USSR accounted for most of this capacity—1,079,970 barrels. The remaining 59 refineries in other Eastern Europe countries can handle 215,000 barrels of crude a day.

Consequently, with 198 refineries in the whole of Europe having daily crude charging capacity of 2,856,680 barrels, daily crude runs to stills last year increased to 2,293,645 barrels, up 516,256 barrels from the previous year's over-all total of 1,777,389 barrels.

The Far East, with 29 refineries and daily crude charging capacity of 327,800 barrels, recorded an increase of 72,291 barrels in daily crude runs to stills. At the close of 1950, the area's daily runs reached 243,290 barrels. At the end of last year, the figure amounted to 315,581 barrels.

Though under the Communists' regime and under the usual curb on the free flow of all technical material, China's single refinery reportedly had a daily crude run to stills total at the close of last year of 2258 barrels, an increase of 742 barrels from the same period the previous year.

The three refineries situated in India, Burma and Pakistan have a daily crude charging capacity of 13,100 barrels. And daily crude runs to stills at those refineries rose 968 barrels daily from 1950's 9355 barrels to 10,323 barrels in 1951.

Japan reported refinery activities for last year that were almost double the previous year. With 19 refineries and daily crude charging capacity of 79,600 barrels, these Japanese installations recorded a 37,839-barrel rise in daily crude runs to stills—from 37,935 barrels in 1950 to 75,774 barrels at the close of 1951.

World Refining Capacity and Operations

(BARRELS)

CONTINENT and COUNTRY	Number of Plants	Daily Crude Charging Capacity	DAILY CRUDE* RUNS TO STILLS 1951	DAILY CRUDE* RUNS TO STILLS 1950
NORTH AMERICA:				
Canada	45	462,350	343,324	295,032
Cuba	5	6,080	8,355	5,065
Mexico	25	553,780	154,516	142,677
United States	338	7,229,000	6,646,194	6,143,484
Total North America	**413**	**8,251,210**	**7,152,389**	**6,586,258**
SOUTH AMERICA:				
Argentina	23	213,110	135,161	116,129
Bolivia	4	10,391	1,226	1,807
Brazil	5	50,000	2,903	1,613
Chile				
Colombia	2	25,900	24,097	26,516
Ecuador	2	11,800	4,806	4,581
Netherlands West Indies	3	677,000	903,871	831,258
Peru	4	32,300	38,742	36,774
Trinidad	6	123,300	89,290	88,871
Uruguay	1	25,000	16,323	13,419
Venezuela	12	347,370	351,000	311,129
Total South America	**62**	**1,516,171**	**1,567,419**	**1,432,097**
WESTERN EUROPE:				
Belgium	3	37,300	52,710	7,226
Denmark	3	620	387	645
France	14	448,250	419,032	314,517
Germany	39	159,340	94,839	90,323
Italy and Trieste	28	197,600	171,355	126,129
Netherlands	2	124,000	129,097	142,355
Norway	1	1,000	1,032	484
Portugal	1	4,600	8,065	5,323
Spain	1	25,000	9,387	5,581
Sweden	4	24,800	20,968	16,129
United Kingdom	16	539,200	436,612	221,645
Total Western Europe	**112**	**1,561,710**	**1,343,484**	**930,357**
EASTERN EUROPE:				
U.S.S.R.	27	1,079,970	804,000	729,032
Other Eastern Europe	59	215,000	146,161	118,000
Total Eastern Europe	**86**	**1,294,970**	**950,161**	**847,032**
Total Europe	**198**	**2,856,680**	**2,293,645**	**1,777,389**
MIDDLE EAST:				
Bahrain Island	1	155,000	209,871	149,774
Iraq	4	16,950	9,677	7,355
Iran	2	552,300	38,710	566,516
Kuwait	1	27,500	26,323	25,710
Lebanon	1	11,000	11,258	11,645
Saudi Arabia	1	160,000	151,290	157,516
Turkey	1	500		
Israel	1	80,000	10,968	13,871
Total Middle East	**12**	**1,003,250**	**458,097**	**932,387**
FAR EAST:				
China	1	17,000	2,258	1,516
India-Burma-Pakistan	3	13,100	10,323	9,355
Japan	19	79,600	75,774	37,935
Netherland East Indies	6	218,100	227,226	194,484
British Borneo				
Total Far East	**29**	**327,800**	**315,581**	**243,290**
AFRICA:				
Canary Islands	1	16,000	16,613	15,710
Egypt	2	47,000	47,613	43,871
French Morocco	1	2,500	2,032	806
Total Africa	**4**	**65,500**	**66,263**	**60,387**
OCEANIA:				
Australia	4	17,500	17,710	15,000
TOTAL WORLD	**722**	**14,038,111**	**11,871,099**	**11,046,808**

* Data from Bureau of Mines "World Petroleum Statistics" for December, 1950 and 1951.

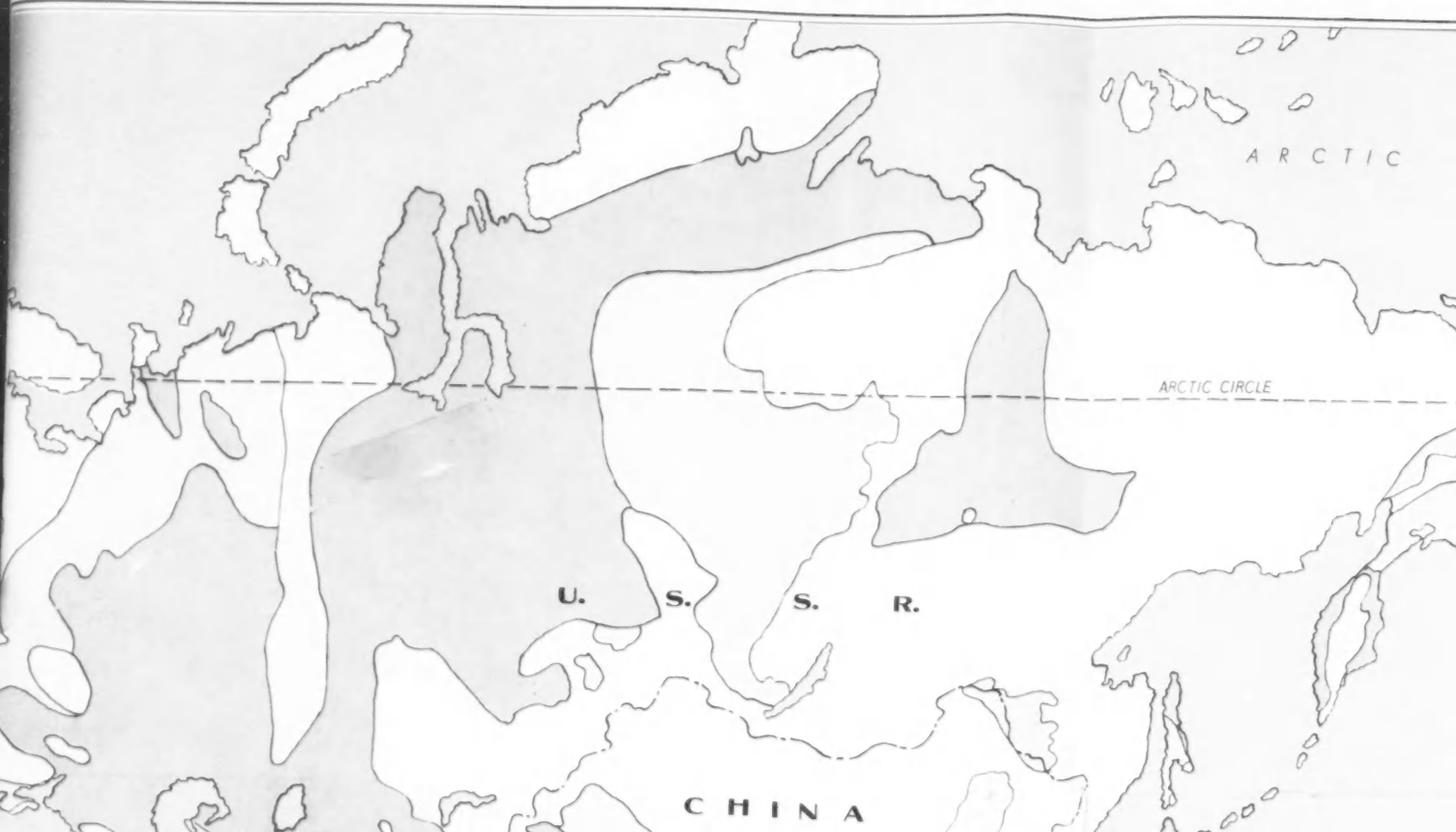
PRINCIPAL COMPANIES—Operating Outside U. S.

Abbreviations: A.G.—Atkiengesellschaft; C.A.—Compañía Anónima; Cía.—Compañía; Cie.—Compagnie; Co.—Company; Corp.—Corporation; G. m. b. H.—Gesellschaft mit beschrankter Haftung; Gw.—Gewerkschaft; Inc.—Incorporated; Ltd.—Limited; Mij.—Maatschappij; N.V.—Naamloose Vennootschap; Pty.—Propretary; S.A.—Socieded Anónima or Société Anonyme·

COMPANY	Location of Producing Fields or Concessions	OWNERSHIP
Abasand Oil, Ltd.	Canada	.....
Amerada Pet. Corp.	Canada	American interests
American Independent Oil Co., Ltd.	Kuwait Neutral Territory	Group of American Independent Companies
American International Fuel and Petroleum Co.	Nicaragua	Gulf Oil Corp. and Atlantic Refg. Co.
Anglo-Bahamian Pet. Co., Ltd.	Bahamas	Anglo-Iranian Oil Co.
Anglo-Canadian Oil Co., Ltd.	Canada	Canadian interests
Anglo-Ecuadorian Oilfields, Ltd.	Ecuador	British interests
Anglo-Egyptian Oilfields, Ltd.	Egypt	Shell Group, Egyptian Government
Anglo-Iranian Oil Co., Ltd.	Iran, Iraq, Kuwait, Bahamas, Great Britain, Trinidad, Egypt (Partly through subsidiaries)	British Government 52½%; Burmah Oil Co., Ltd. 25%; individuals 22½%
Antilles Pet. Co. (Trinidad), Ltd.	Trinidad	McColl-Frontenac Oil Co.
Apex (Trinidad) Oilfields, Ltd.	Trinidad	British interests
Arabian-American Oil Co.	Saudi Arabia	Standard Oil Co. of Calif. 30%; Standard Oil Co. (New Jersey) 30%; The Texas Co. 30%; Socony-Vacuum Oil Co. 10%
Ashley Gold and Minerals, Ltd.	Canada	Canadian interests
Assam Oil Co.	India	Burmah Oil Co.
"Astra" Cía. Argentina de Petróleo S.A.	Argentina	Argentine interests
Atlantic Refining Co.	Cuba, Venezuela, Haiti	Atlantic Refining Co.
Attock Oil Co., Ltd.	Pakistan	Burmah Oil Co. and other British interests
Australasian Pet. Co. Pty., Ltd.	New Guinea	Anglo-Iranian Oil Co.; Socony-Vacuum Oil Co.
Azienda Generale Italiana Petroli	Italy	Italian Government
Azienda Italiana Petroli Albania	Albania	Italian Government
Bahamas Oil Co., Ltd.	Bahamas	Superior Oil Co. of Calif.
Bahamas Oil Exploration, Ltd.	Bahamas	Gulf Oil Corp.
Bahamas Mining Co., Ltd.	Bahamas	F. H. Christie et al.
Bahrein Pet. Co., Ltd.	Bahrain	Standard of Calif. and The Texas Co.
Basrah Petroleum Co., Ltd.	Iraq	Iraq Pet. Co.
Bata Petroleums, Ltd.	Canada	.....
N.V. Bataafsche Pet. Mij.	Netherlands Indies	Shell Group
Bear Oil Co., Ltd.	Canada	Tide Water, Pacific Western, Skelly Oil, Sunray Oil, Pacific Petroleums, Ltd.
Bonaparte Gulf Company, Pty., Ltd.	Australia	Vacuum Oil Co. Pty., Ltd & Australian and British interests
Braunschweigische Bohrgesellschaft	Germany	German Government
British American Oil Co., Ltd.	Canada	Canadian interests
British Bahamian Oil Dev. Co., Ltd.	Bahamas	Central Mining and Investment Co.
British Controlled Oilfields, Ltd.	Venezuela, Ecuador	British interests
British Malayan Pet. Co., Ltd.	British Borneo	Shell Group
Burbach-Kaliwerke A.G.	Germany	.....
Burmah Oil Co., Ltd.	Burma, India	British interests
Caldas Pet. Co.	Colombia	The Texas Co.
Calgary and Edmonton Corp., Ltd.	Canada	Canadian interests
The California Standard Co.	Canada	Standard of Calif.
Calmont Oils, Ltd.	Canada	Canadian interests
Canadian Gulf Oil Co.	Canada	Gulf Oil Corp.
Caracas Pet. S.A.	Venezuela	British interests
Carolina Oil Co.	Ecuador	Ecuadorian interests
Central Area Exploration Co.	Venezuela	British interests
Chinese Pet. Corp.	China	Chinese Government
Colombian Pet. Co.	Colombia	Socony-Vacuum Oil Co. 50%; Texas Co. 50%
Colón Development Co., Ltd.	Venezuela	Shell Group
Commoil, Ltd.	Canada	Commonwealth Pet., Ltd.
Cie des Pétroles de Tunisie Shell	Tunisia	Shell Group 65%; SEREPT 35%
Cie Francaise de Pétroles	Iraq	French Government
Cía. Arrendataria del Monopolio de Petróleos S.A. (CAMPSA)	Spain	Spanish Government
Cía. Colombiana de Petróleo El Condor	Colombia	Shell Group
Cía Consolidada de Petróleo	Venezuela	Sinclair Oil Corp.
Cía. de Petróleo del Cravo	Colombia	Tropical Oil Co.
Cía. de Petróleo Ganso Azul, Ltd.	Peru	American interests
Cía. de Petróleo Gran Colombia, S.A.	Colombia	The Texas Co., Richmond Pet. Co., Socony-Vacuum Oil Co.
Cía. de Petróleo Shell de Colombia	Colombia	Shell Group
Cía. de Petróleos del Pacifico	Colombia	Socony-Vacuum Oil Co.
Cía. "El Sosneado" de Petróleo	Argentina	Argentine private interests
Cía. Espanola de Petróleos S.A. (CEPSA)	Venezuela	Spanish interests and Creole Pet. Corp.
Cía. Espanola de Petróleos Scientificas Investigaciones	Spain	Socony-Vacuum Oil Co. and Spanish interests
Cía. Ferrocarrilera de Petróleo	Argentina	British Railways of Argentina
Cía. Peruana de Petróleo "El Oriente"	Peru	Peruvian private interests
Cía. Petrolera la Estrella de Cuba	Cuba	Shell Group
Cía. Petrolera Lobitos	Peru	Lobitos Oilfields, Ltd.
Cía. Petrolera del Zulia	Colombia	Tropical Oil Co.
Cías. Unidas de Petróleo	Colombia	Sinclair, Cities Service and Richfield
Colon Development Co.	Venezuela	Shell Group
Concepción Ecuadorian Oilfields, Ltd.	Ecuador	British interests
Condamine Oil Pty., Ltd.	Australia	Australian interests
Conselho Nacional de Petróleo	Brazil	Brazilian Government
Corporación de Fomento de la Producción	Chile	Chilean Government
Creole Petroleum Corp.	Venezuela	Standard Oil Co. (N.J.)
Daido Oil Co.	Japan	Japanese interests
Danish-American Prospecting Co.	Denmark	Gulf Oil Corp.
D'Arcy Exploration Co., Ltd.	England	Anglo-Iranian Oil Co., Ltd.
Decalta Oils	Canada	Canadian interests
Deilman, C. (formerly DEUTAG)	Germany	German interests
Deutsche Erdöl A.G. (DEA)	Germany, Austria	.....
Deutsche Vacuum Oel A.G.	Germany	Socony-Vacuum Oil Co.
Diadema Argentina S.A. de Petróleo	Argentina	Shell Group
Ecuador Oilfields, Ltd.	Ecuador	British Controlled Oilfields, Ltd.
Ecuador Tropical Oil Co.	Ecuador	Ecuadorian interests
Eguchi Oil Association	Japan	Japanese interests
Empresa Petrolera Fiscal	Peru	Peru Government
Erdol Produktions Gesellschaft	Austria	German interests
Esso Petroleum Co., Ltd.	Great Britain	Standard (N.J.) and British interests
Esso Standard Oil Co. (Ecuador) S.A.	Ecuador	Standard Oil Co. (N.J.)
Far East Development Co.	Philippines	American interests
Foothills Oil and Gas Co., Ltd.	Canada	Imperial Oil, Ltd. 85.2%
Ganzo Azul Petrol Co.	Peru	American interests
Gaspé Oil Ventures, Ltd.	Canada	.....
General Petroleums, Ltd.	Canada	Canadian interests
Gw. Brenner	Germany	German interests
Gw. Brigitta	Germany	Shell Group; Standard (N.J.)
Gw. Elwerath	Germany, Austria	German interests
Gw. Franz	Germany	German interests
Gw. Norddeutschland	Germany	German interests
Gw. Vereinigte Borgholzhausen	Germany	German interests
Grossdeutsche Schachtbau und Tiefbohrgesellschaft	Germany	German interests
Guasare Oil Co.	Venezuela	Drilling and Exploration Co.; Lion Oil Refining Co., et al
Gute Hoffnungshutte	Germany	German interests
Hamburger Gasgesellschaft	Germany	German interests
Hokkaido Oil Development Co.	Japan	Japanese interests
Hokuriku Oil Association	Japan	Japanese interests
Home Brazeau Syndicate	Canada	Home; Anglo-Canadian; Imperial; Shell; Socony-Vacuum; Cal. Standard
Home Oil Co., Ltd.	Canada	Canadian interests
Honolulu Oil Corp.	Canada, Costa Rica	Honolulu Oil Co.
Hudson's Bay Oil & Gas Co., Ltd.	Canada	Continental Oil Co. (Del.)
Husky Oil & Refg. Co.	Canada	Husky Refg. of Wyo.
Imperial Oil Co.	Japan	Japanese interests; Japanese Government
Imperial Oil Ltd.	Canada	Standard (N.J.) 70%
Indo-Burma Pet Co., Ltd.	Burma	British interests
International Ecuadorean Pet. Co.	Ecuador	Standard Oil Co. (N.J.)
International Pet. Co., Ltd.	Peru, Venezuela	Standard (N.J.); holds 25% interest in Mene Grande's Venezuelan production
International Tiefbohr-Kommandit Gesellschaft (ITAG)	Germany, Austria	German interests
Iraq Petroleum Co., Ltd.	Iraq	Anglo-Iranian 23.75%; Shell Group 23.75%; Near East Development Co. 23.75%; Cie Francaise des Petroles 23.75%; C. I. Gulbenkian 5%
Ishikawa Co.	Japan	Japanese interests
Island Development Co., Ltd.	Canada	Cities Service Oil Co.; Socony-Vacuum Oil Co.
Jordan Exploration Co., Ltd.	Palestine	British interests
Kaliwerke Salzdetfürth	Germany	.....
Karuta Industrial Co.	Japan	Japanese interests
Kermanshah Pet. Co., Ltd.	Iran	Anglo-Iranian Oil Co., Ltd.
Kern Trinidad Oilfields, Ltd.	Trinidad	Kern Oil Co., Ltd.
Khanaqin Oil Co., Ltd.	Iraq	Anglo-Iranian Oil Co., Ltd.
Khaneh Pet. Co.	Iraq	Iraq Pet. Co.; Anglo-Iranian Oil Co.
Kohle-Öl-Union von Busse A.G.	Germany	.....
Koller, Ferd. and Sohn	Germany	German interests
Kuwait Oil Co., Ltd.	Kuwait	Gulf Exploration Corp. 50%; Anglo-Iranian 50%
La Junta Pet. Co.	Colombia	The Texas Co.

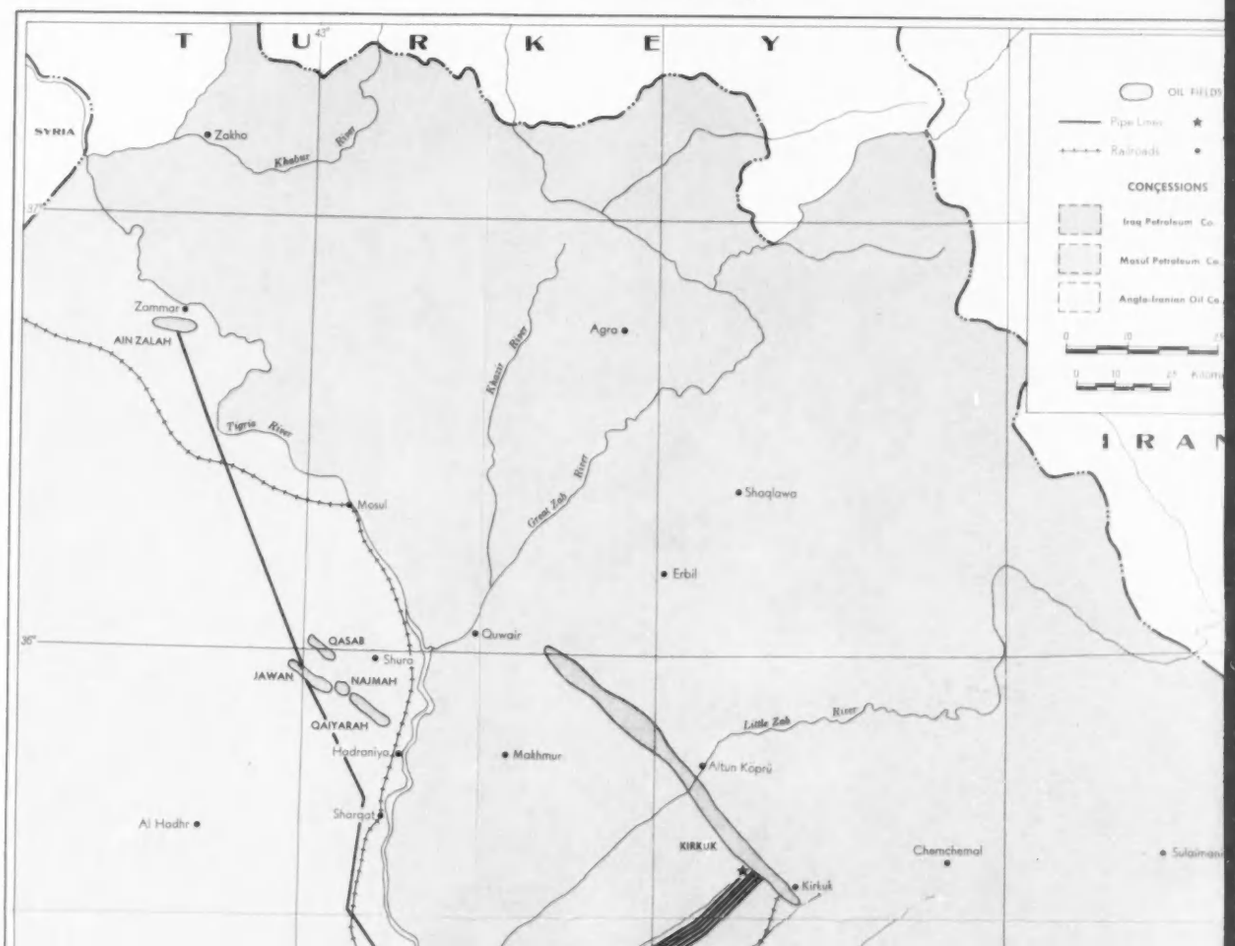
WO
OI

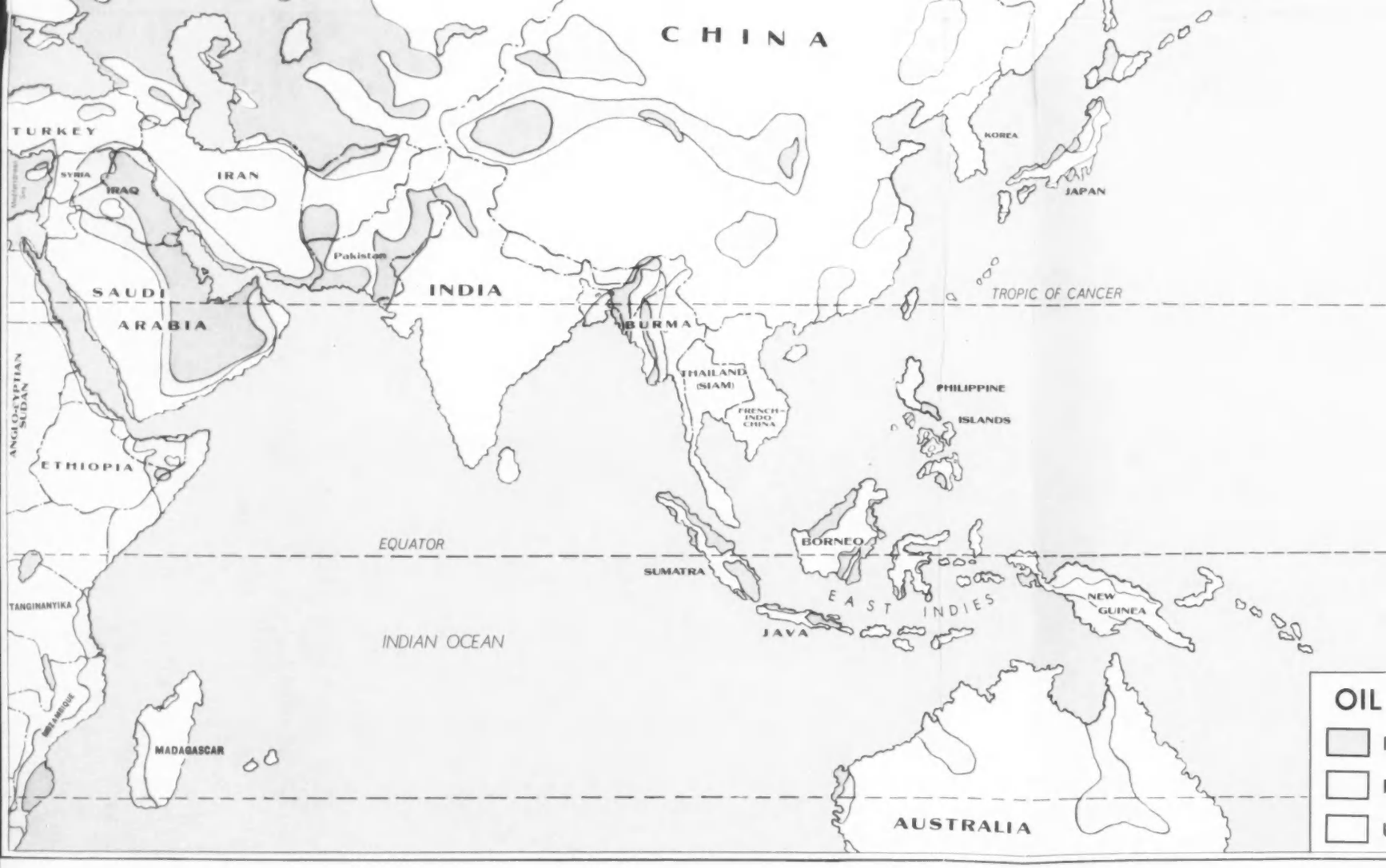
ASIA



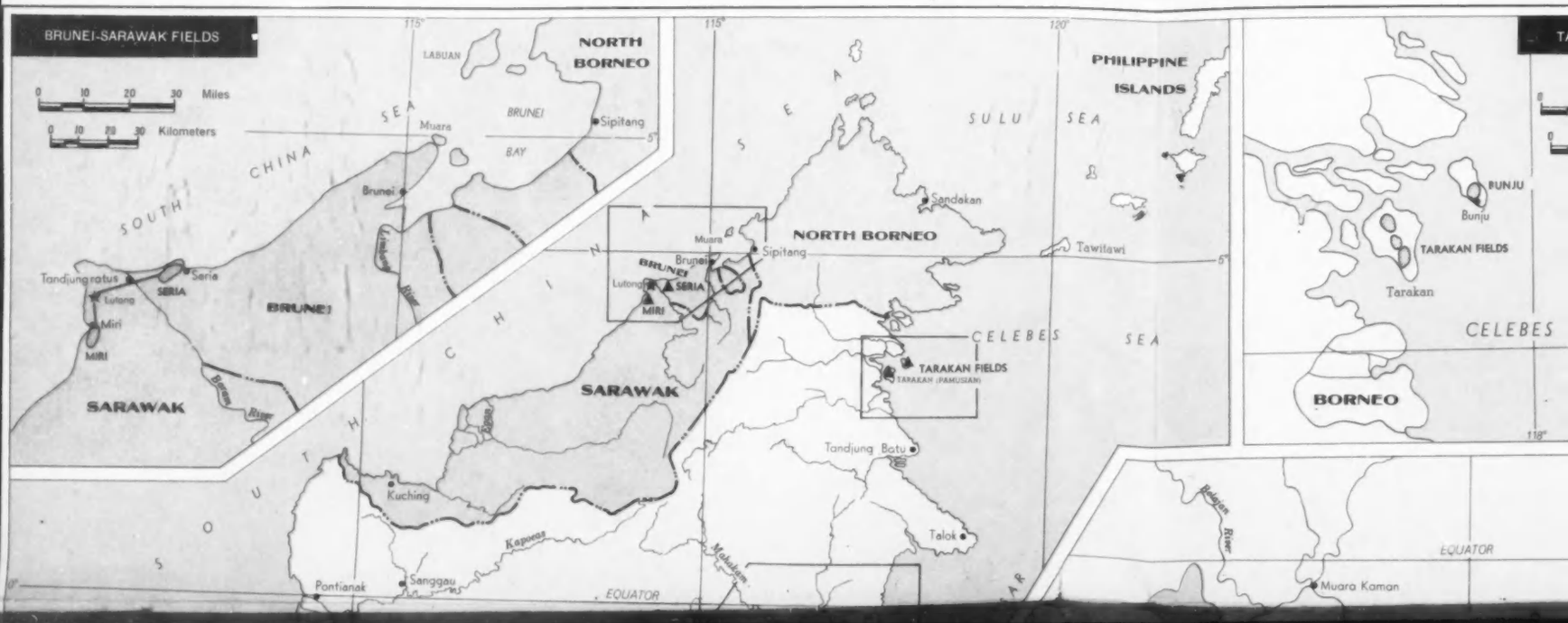
ORLD OIL'S 19
IL MAP OF AS

IRAQ





KALIMANTAN (BORNEO)-BRUNEI-SARAWAK



PACIFIC OCEAN

OIL POSSIBILITIES

- FAVORABLE AREAS
- POSSIBLE AREAS
- UNFAVORABLE AREAS

AK

TARAKAN FIELDS

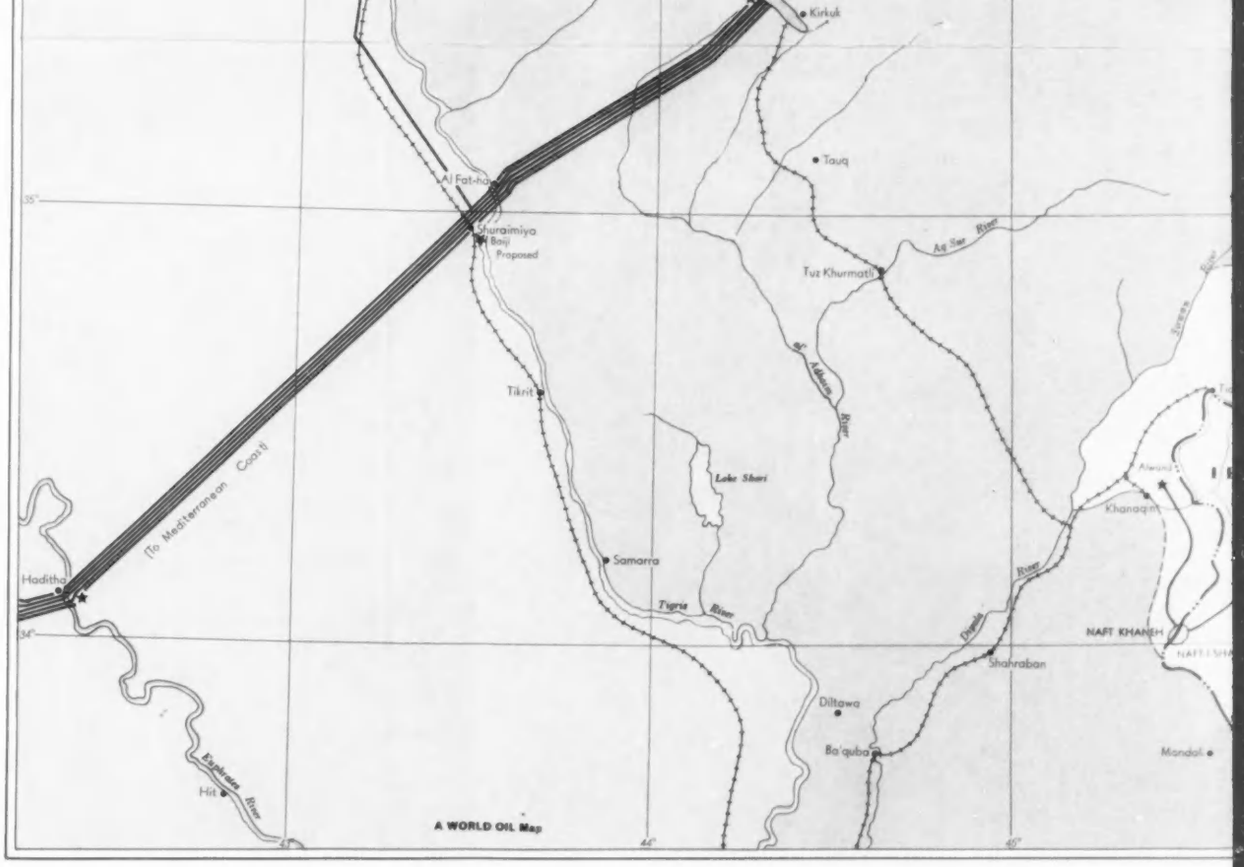
0 10 20 Miles

0 10 20 Kilometers

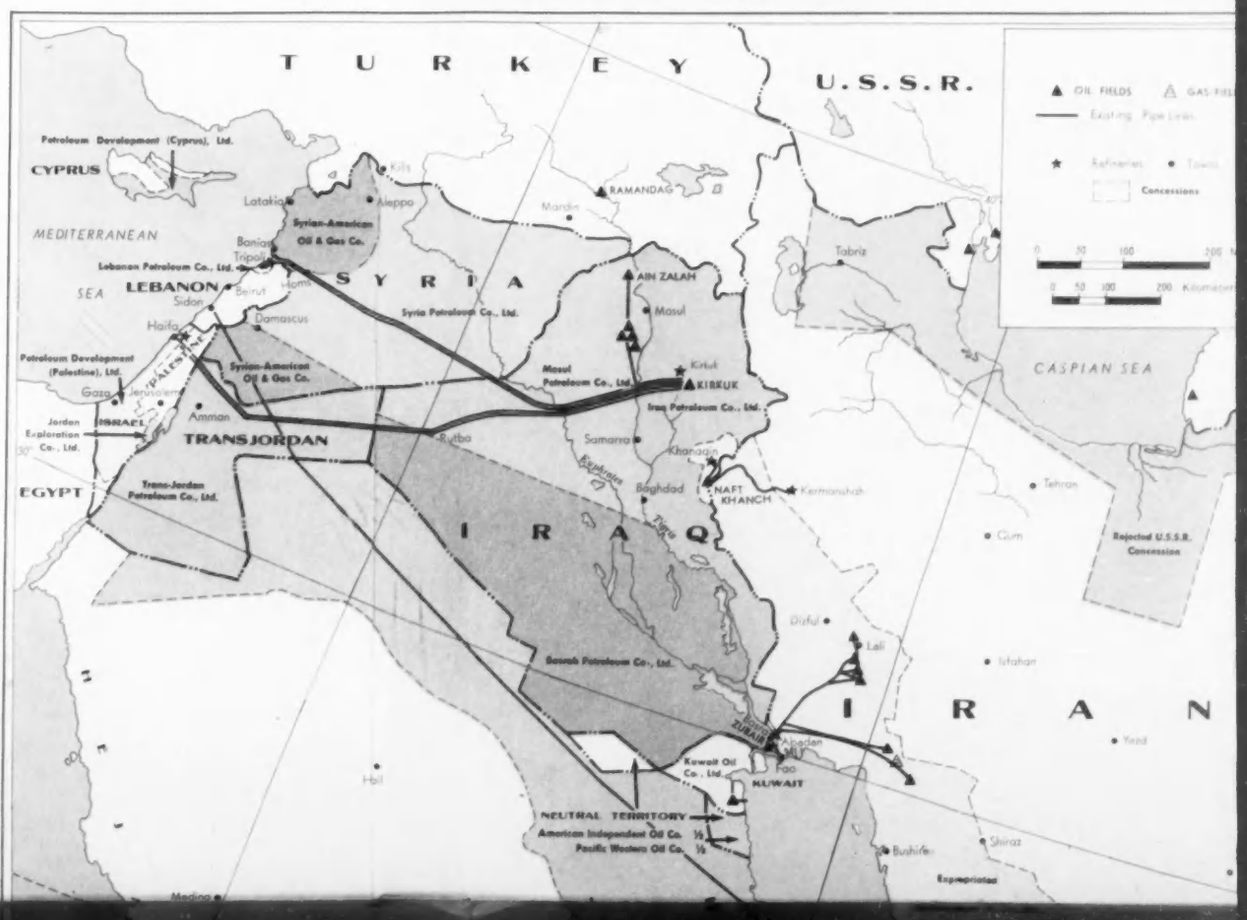
RUNJU

IELDS

ELEBES SEA

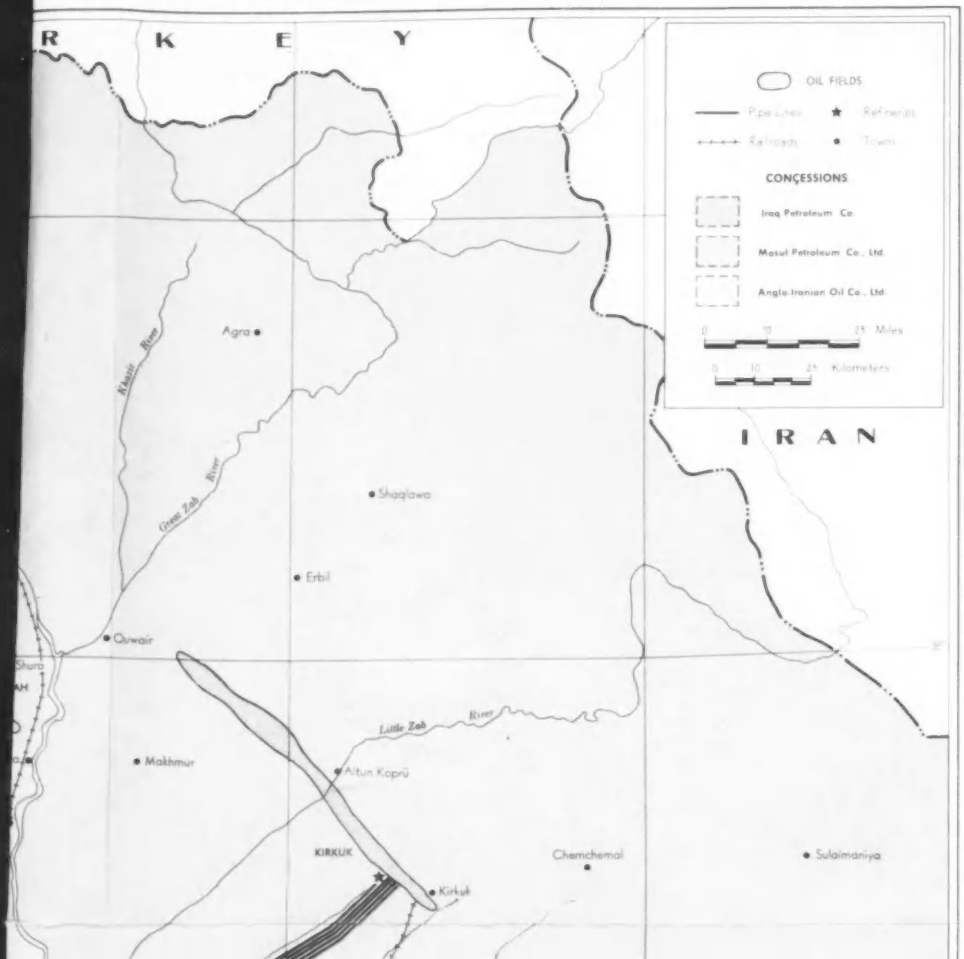


MIDDLE EAST

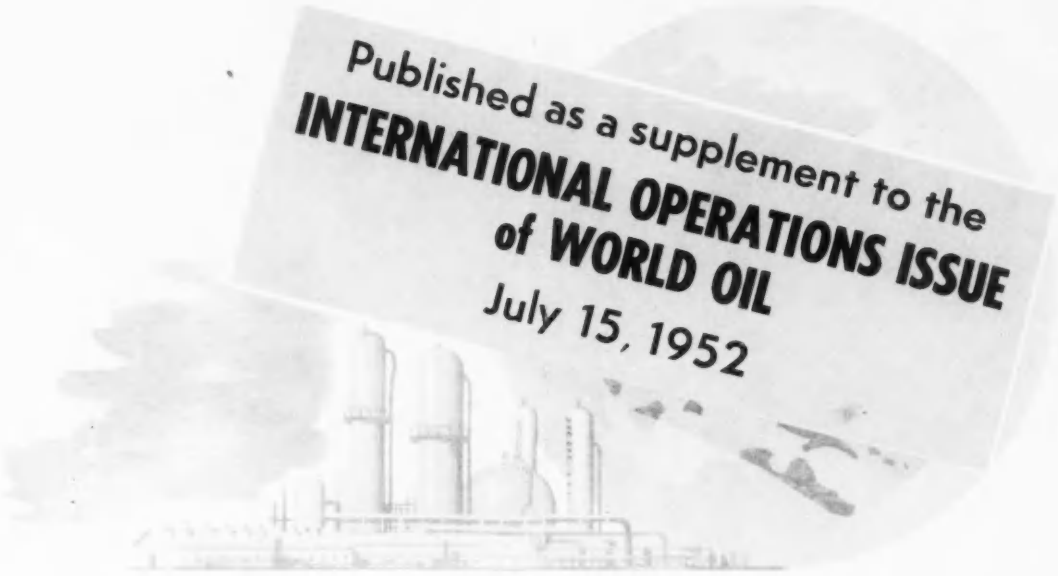


OIL'S 1952 OF ASIA

IRAQ



Appea
Bahrein . .
British Born
Burma . . .
China . . . .
India . . . .



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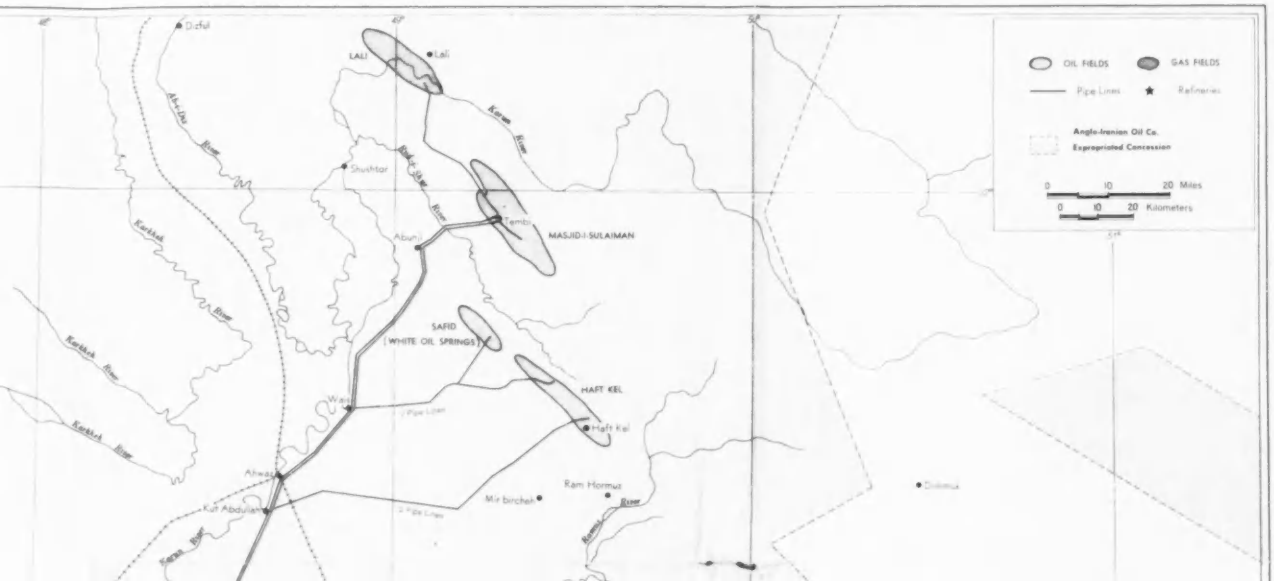
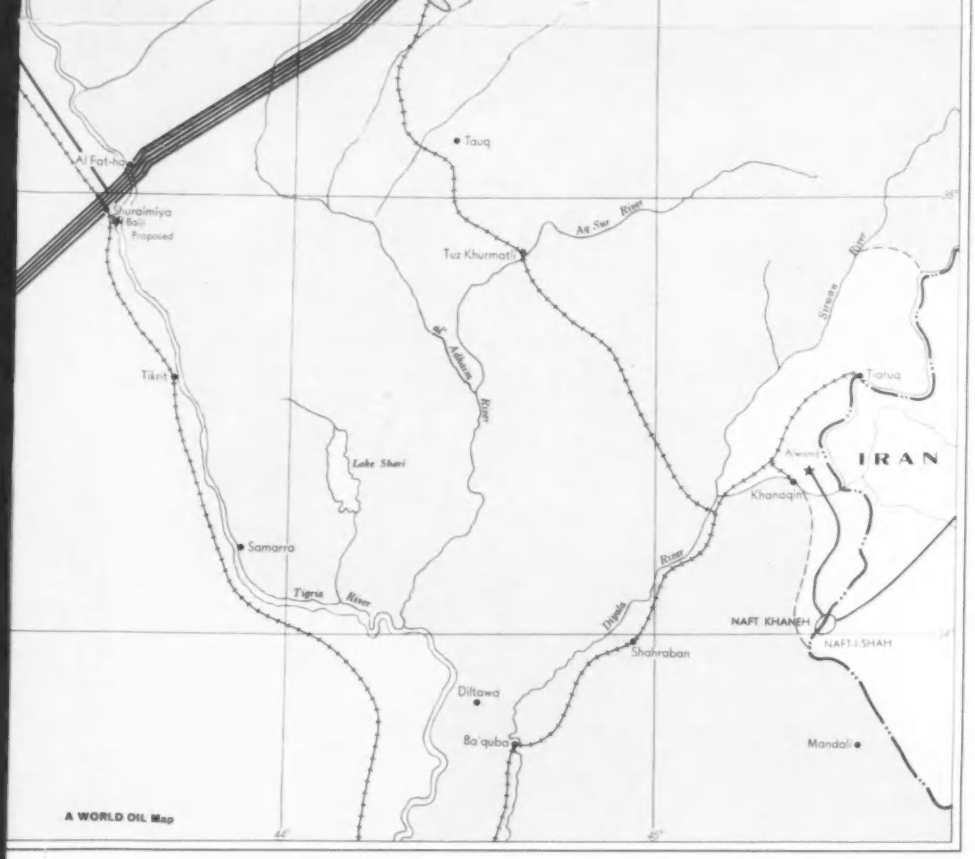
Neutral Zone 208
Pakistan 228
Philippines 228
Qatar 208
Saudi Arabia 208
Turkey 212

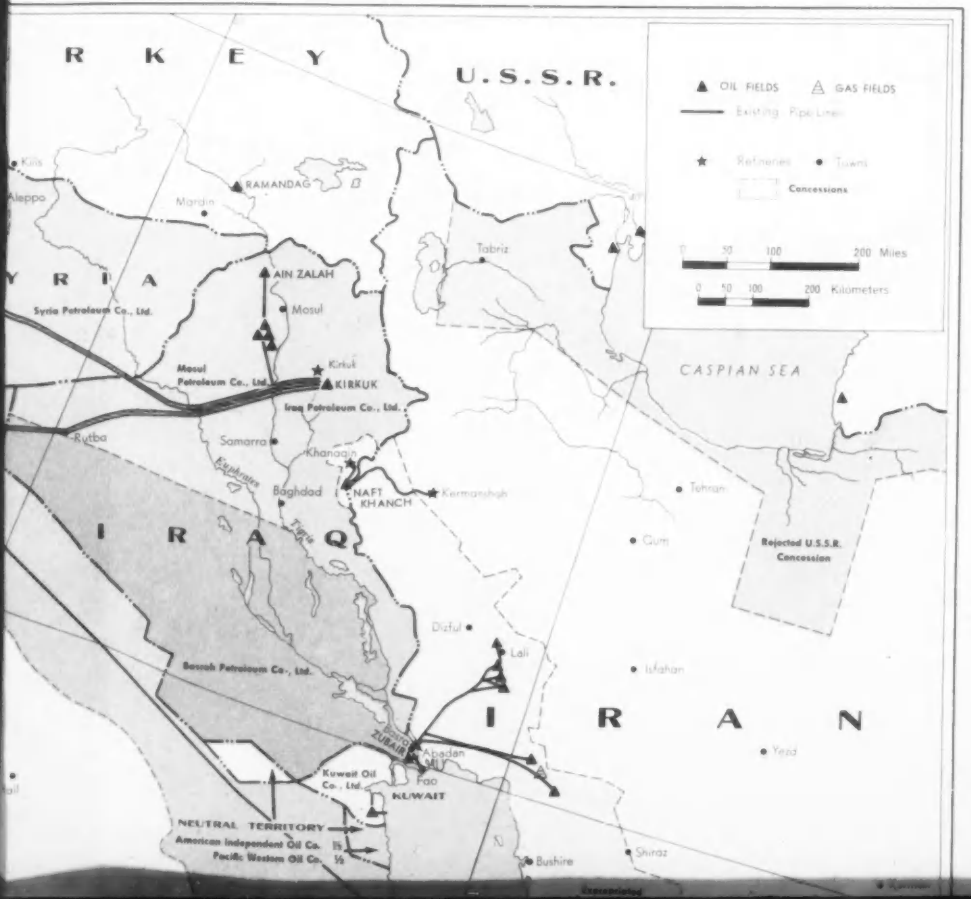
IRAN



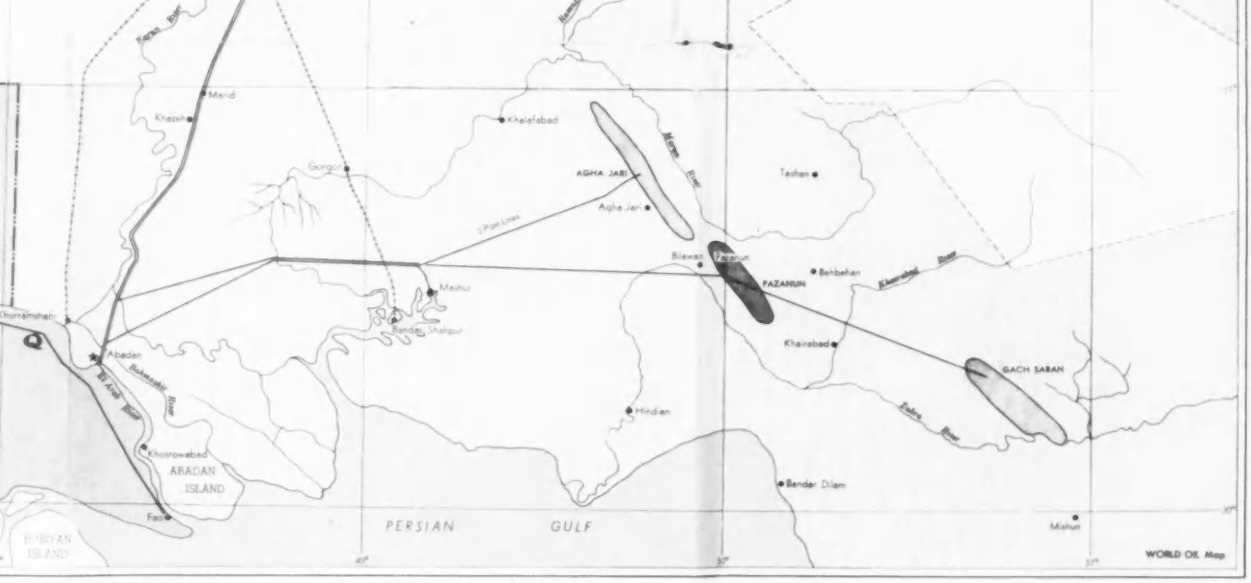

Tauq
Al Fat-ha
Shuraimiya
Bazi
Proposed
Tuz Khurmatu
Aq Su
Diyala
Tikrit
Tigris
Lake Shari
Samarra
Tigris River
Diyala River
Shahraban
Diltawa
Ba'quba
Mandali
NAFT KHANEH
NAFT-I-SHAH
Khanaqin
IRAN
A WORLD OIL Map

Tigris
Lake al Hammar
Basrah
Khorramshahr
I R A Q
KUWAIT

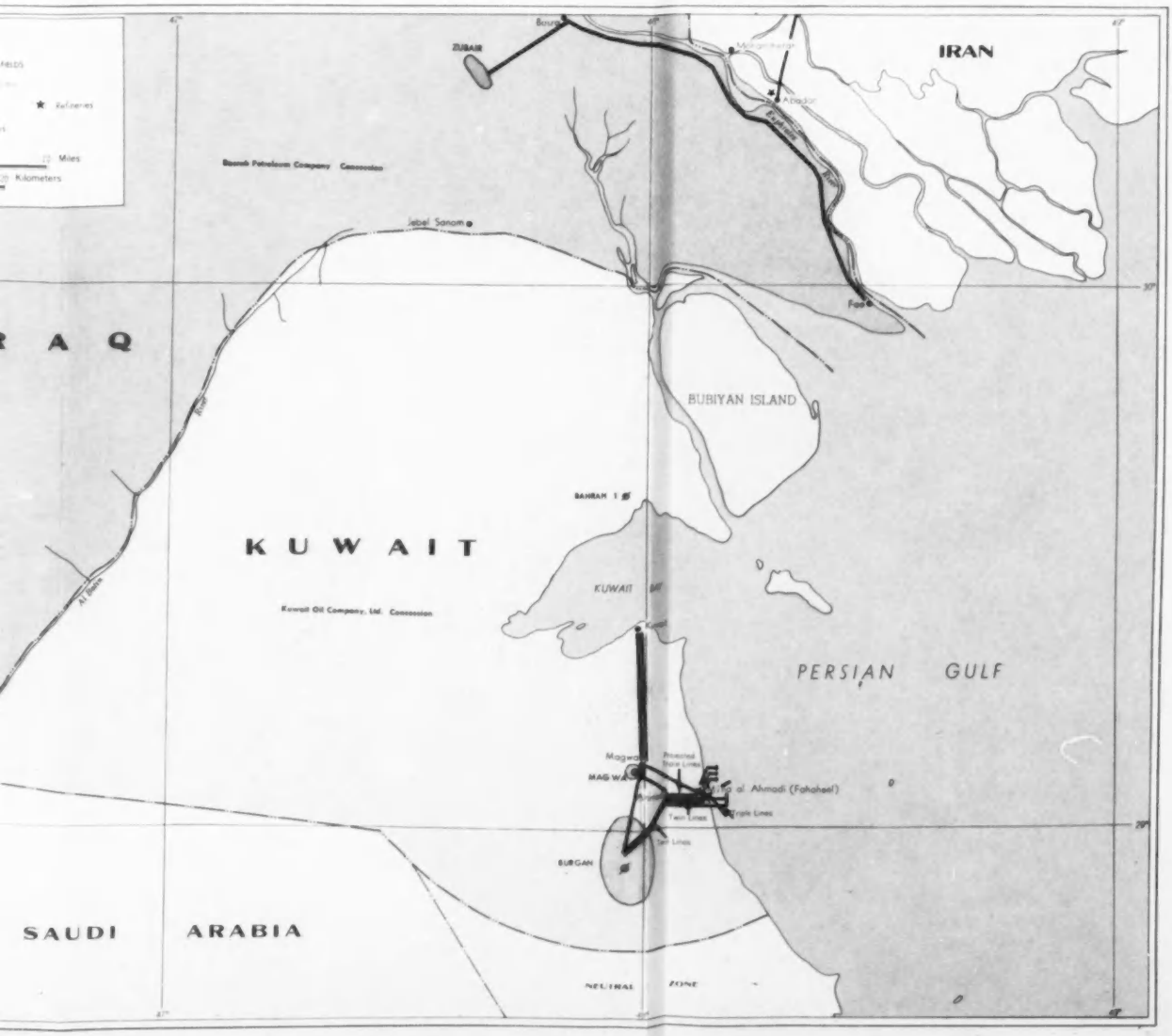
MIDDLE EAST

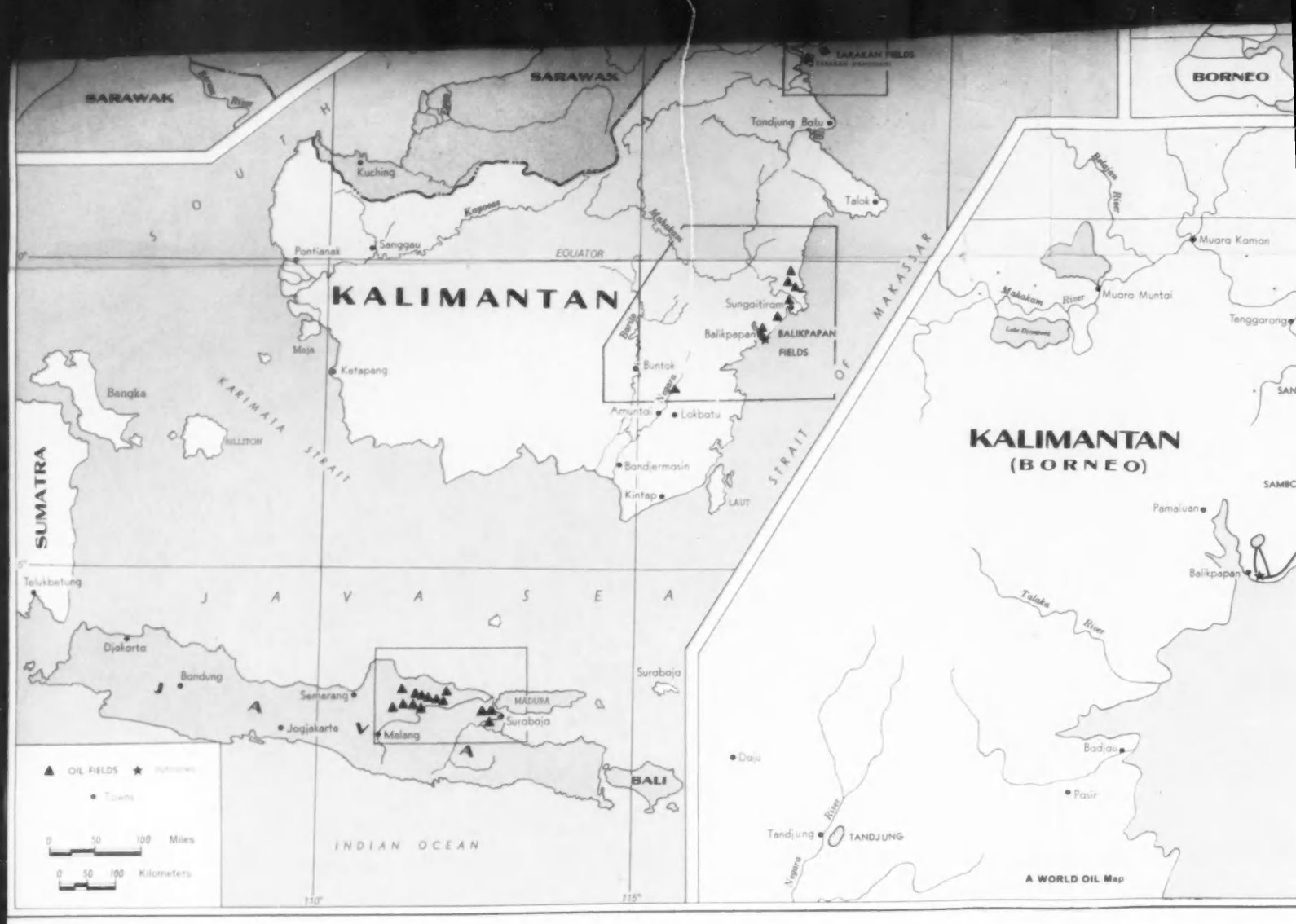

R K E Y
U.S.S.R.
OIL FIELDS
GAS FIELDS
Existing Pipe Lines
Refineries
Towns
Concessions
0 50 100 200 Miles
0 50 100 200 Kilometers
Kilis
Aleppo
Mardin
RAMANDAG
Tabriz
Y R I A
AIN ZALAH
Syria Petroleum Co., Ltd.
Mosul
Kirkuk
KIRKUK
Mosul Petroleum Co., Ltd.
Iraq Petroleum Co., Ltd.
Rutba
Samarra
Khanaqin
Euphrates
Baghdad
NAFT KHANCH
Kermanshah
CASPIAN SEA
Tehran
I R A Q
Qum
Rejected U.S.S.R. Concession
Dizful
Lali
Basrah Petroleum Co., Ltd.
Isfahan
I R A N
ZUBAIR
Abadan
Yezd
Kuwait Oil Co., Ltd.
Fao
KUWAIT
NEUTRAL TERRITORY
American Independent Oil Co.
Pacific Western Oil Co.
Bushire
Shiraz

OIL FIELDS
Pipe Lines
Towns
Kilometers
I R A
NEUTRAL ZONE
SAU
WORLD OIL Map

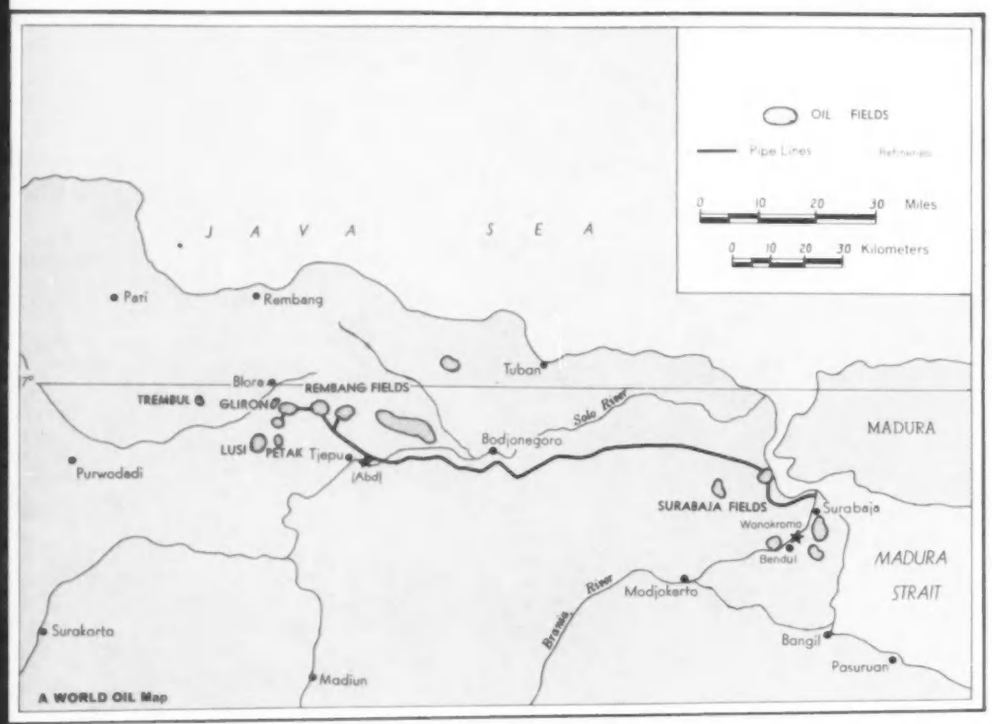


KUWAIT-SOUTHEAST IRAQ

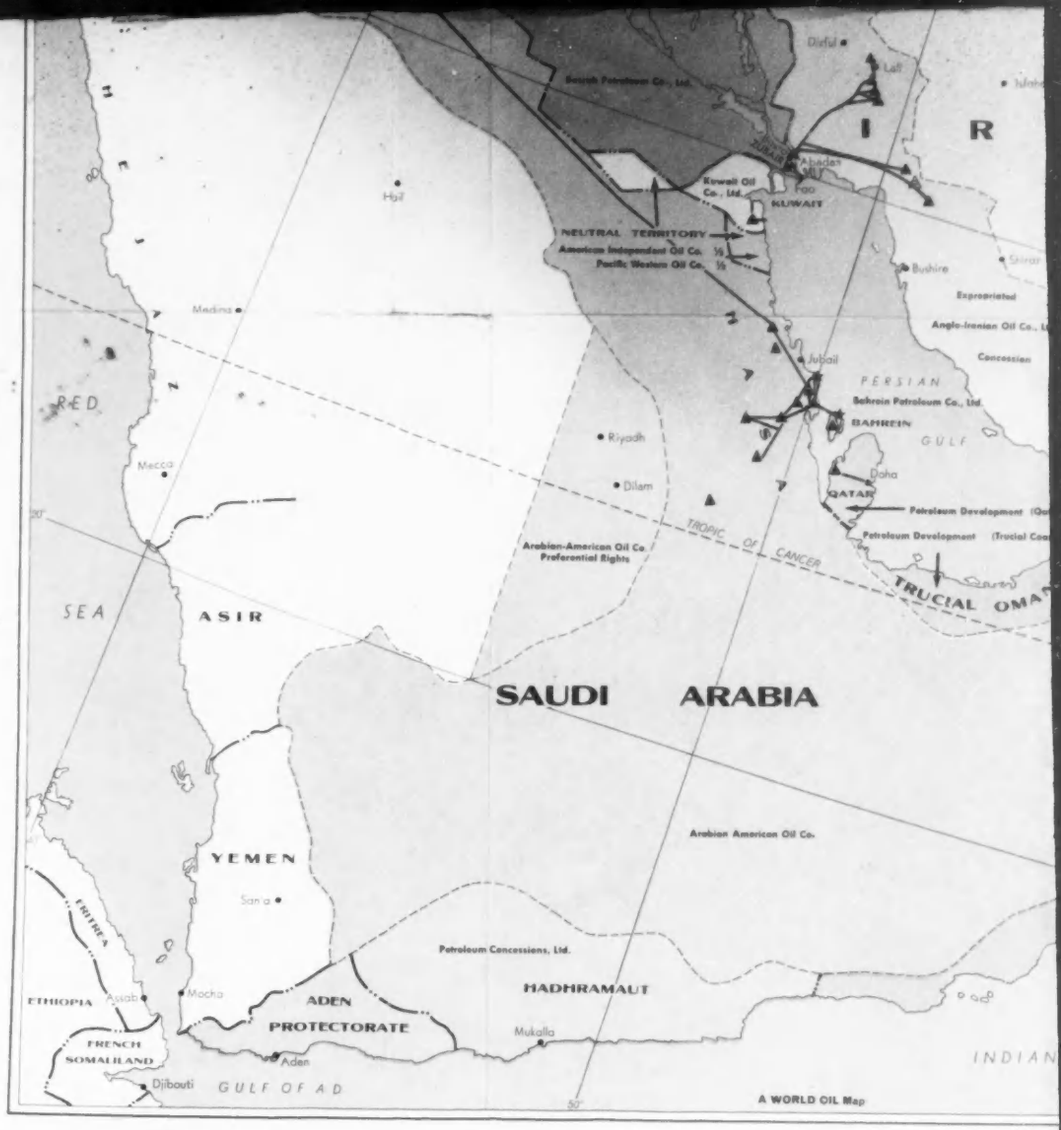




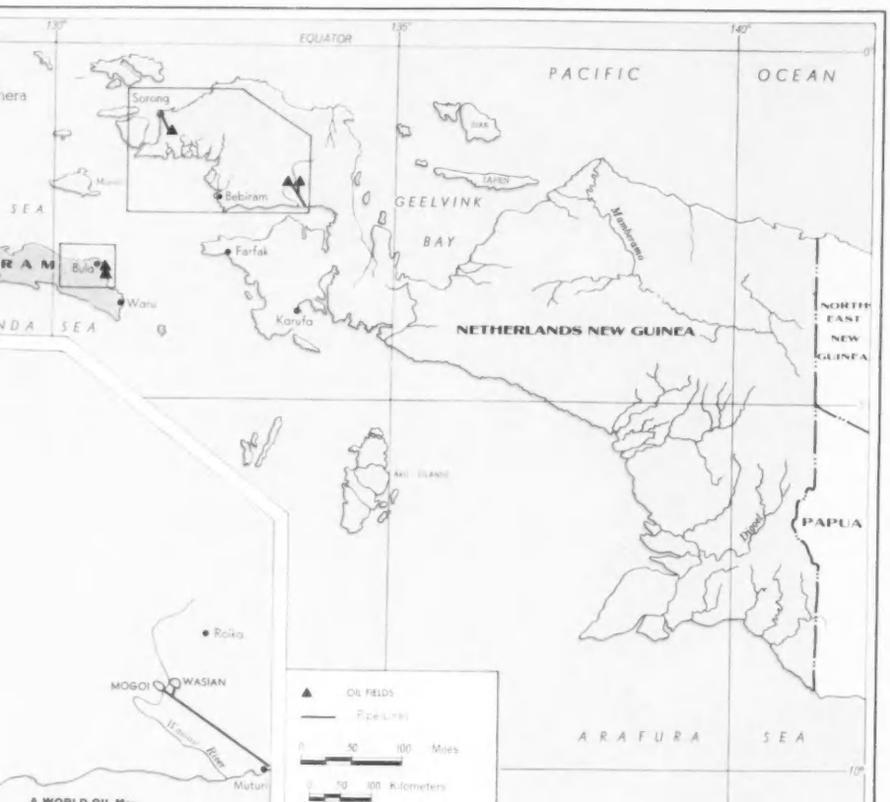
JAVA



CERAM-NETHE

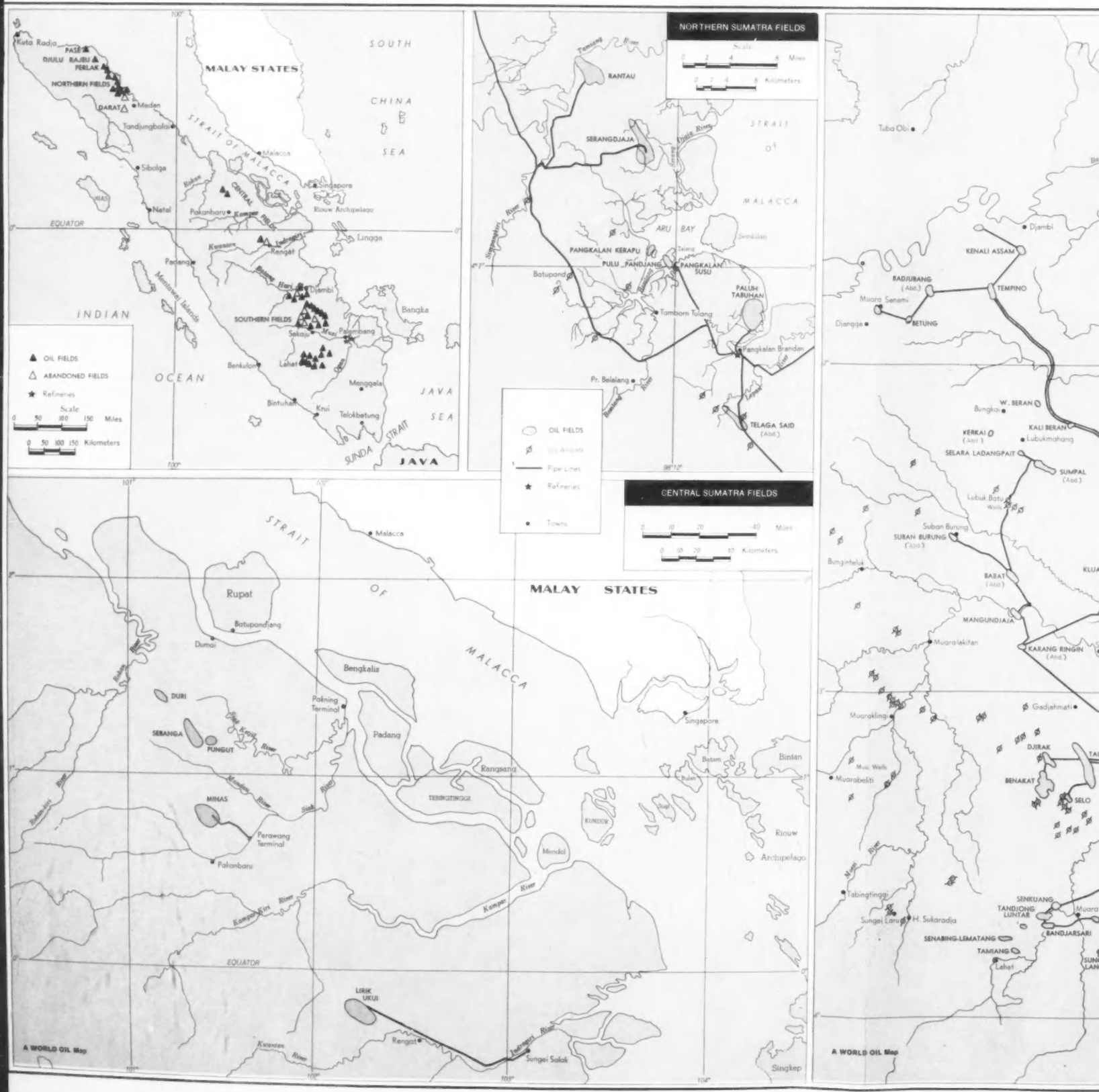


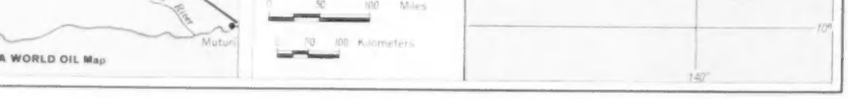
HERLANDS NEW GUINEA

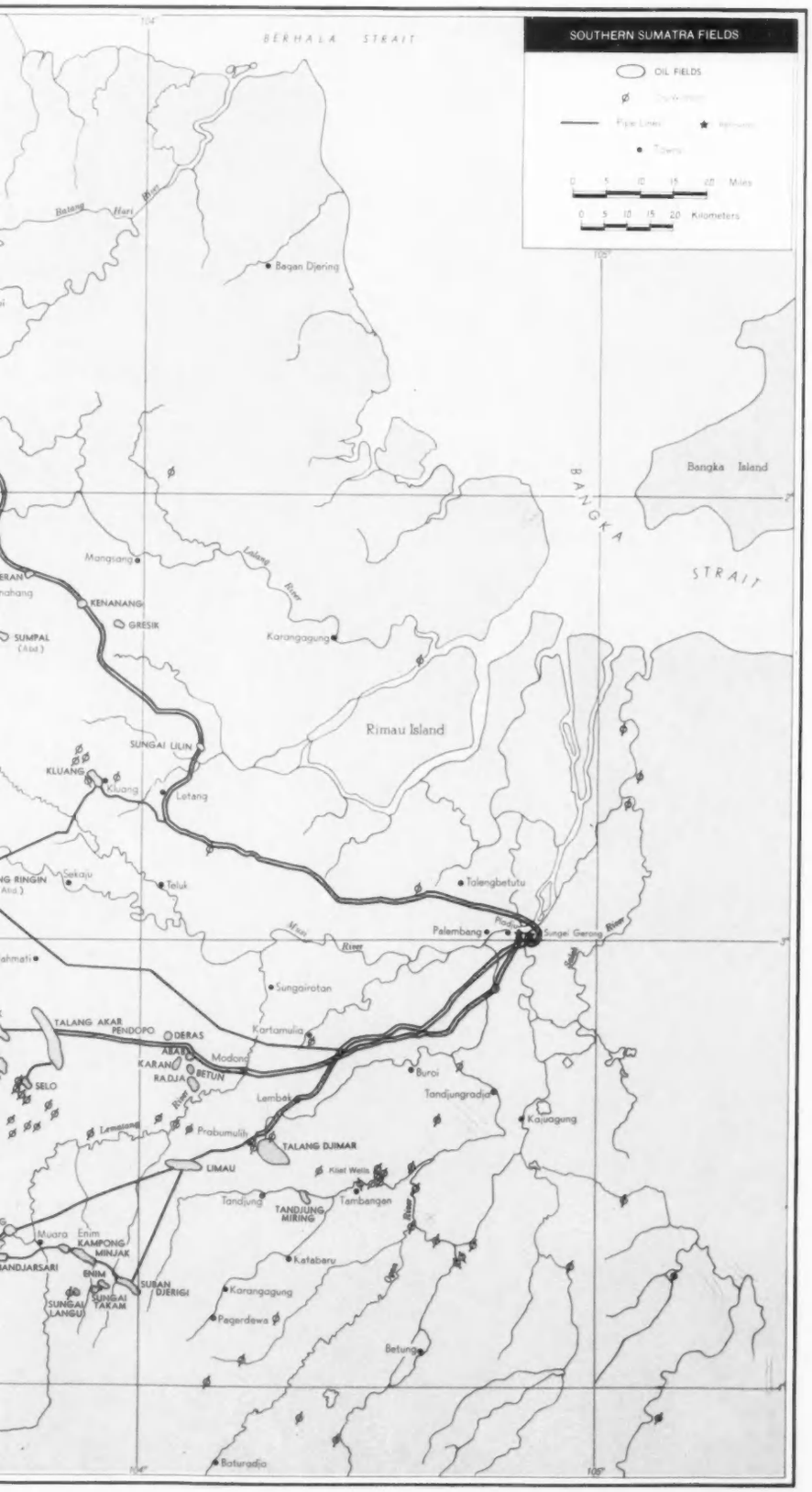


JAPAN

SUMATRA

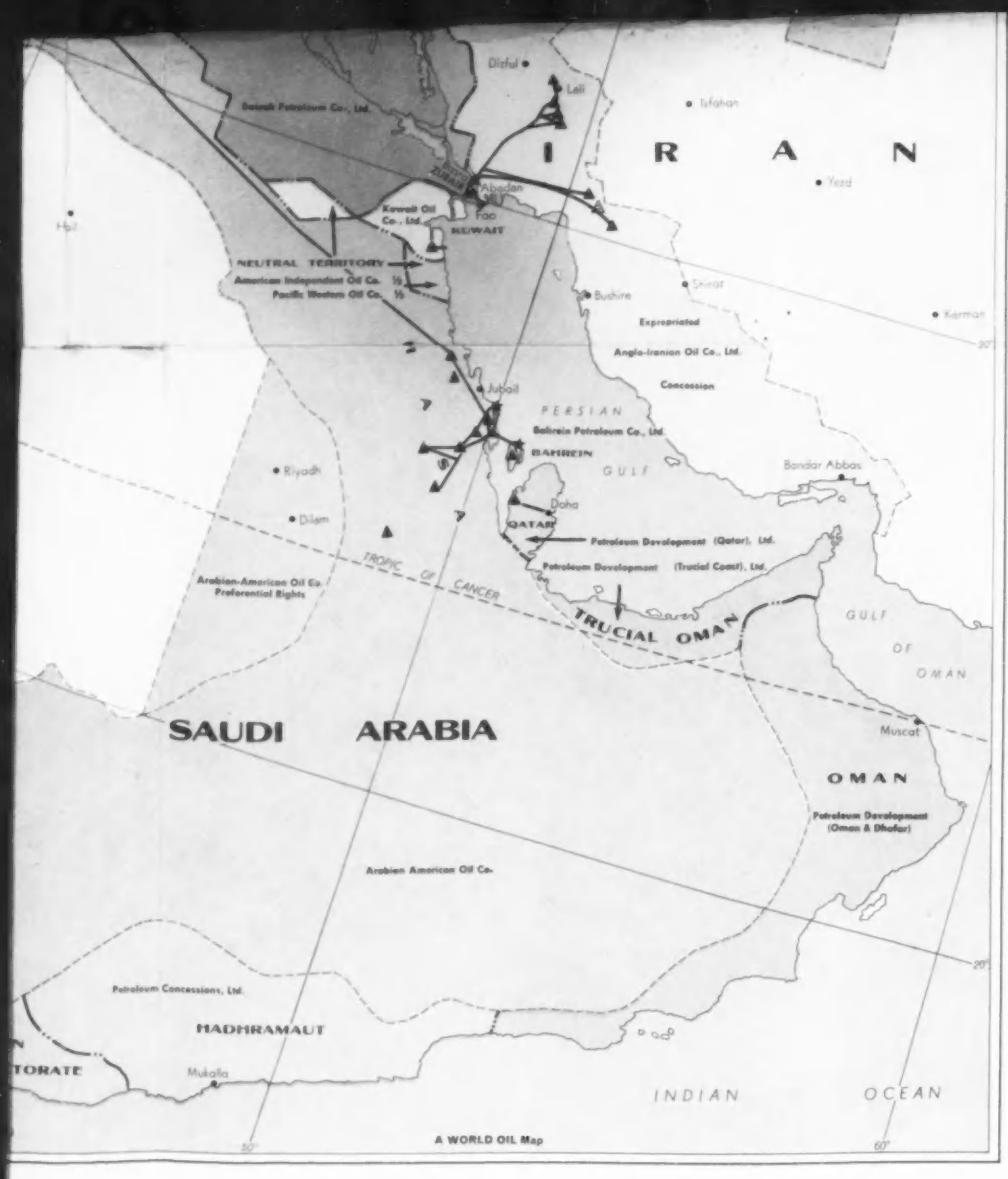

NORTHERN SUMATRA FIELDS
CENTRAL SUMATRA FIELDS
MALAY STATES
SOUTH CHINA SEA
STRAIT OF MALACCA
INDIAN OCEAN
JAVA SEA
SUNDA STRAIT
JAVA
OIL FIELDS
ABANDONED FIELDS
Refineries
Pipe Lines
Towns
Scale
Miles
Kilometers
Kuta Radja
PASE
DJULU RAJEU
PERLAK
NORTHERN FIELDS
DARAT
Medan
Tandjungbalai
Sibolga
Natal
Pakanbaru
CENTRAL FIELDS
Kampar
Rengat
Lingga
Padang
Djambi
SOUTHERN FIELDS
Palembang
Sekajo
Lahat
Benkulen
Bintuhan
Krui
Telokbetung
Mentawai Islands
Bangka
Singapore
Riouw Archipelago
Malacca
EQUATOR
RANTAU
SERANGDJAJA
ARU BAY
PANGKALAN KERAPU
PULU PANDJANG
PANGKALAN SUSU
PALUH TABUHAN
Batupandjang
Tamborn Tulang
Pangkalan Brandan
Pr. Belalang
TELAGA SAID
Rupat
Dumai
Bengkalis
DURI
SEBANGA
PUNGUT
MINAS
Perawang Terminal
Pakning Terminal
Padang
Rangsang
TEBINGTINGGI
KUNDUR
Mendol
Riouw Archipelago
Batam
Bintan
Singapore
LIRIK
UKUI
Rengat
Sungei Salak
Singkep
Tuba Obi
Djambi
KENALI ASSAM
RADJUBANG
TEMPINO
Muara Senemi
Djangga
BETUNG
W. BERAN
Bungkal
KERKAI
KALI BERAN
Lubukmahang
SELARA LADANGPAIT
SUMPAL
Lubuk Batu
Suban Burung
Bungintelut
BABAT
MANGUNDJAJA
Muaralakitan
KARANG RINGIN
Gadjahmati
Muarakling
Muarabelati
DJIRAK
BENAKAT
SELO
Tabingtinggi
Sungei Laru
H. Sukaradja
SENKUANG
TANDJONG LUNTAS
BANDJARSARI
SENABING-LEMATANG
TAMIANG
Lahat
A WORLD OIL Map


Mutuni
A WORLD OIL Map
Miles
Kilometers
140°


SOUTHERN SUMATRA FIELDS
OIL FIELDS
Pipe Lines
Towns
Miles
Kilometers
BERHALA STRAIT
BANGKA STRAIT
Bangka Island
Rimau Island
Began Djering
Mangsang
KENANANG
GRESIK
SUMPAL
Karangagung
SUNGAI LILIN
KLUANG
Kluang
Letang
Sekaju
Teluk
Talengbetutu
Palembang
Sungai Gerong
Sungairotan
TALANG AKAR PENDOPO
DERAS
AKAR KARANG
RADJA
BETUN
Modong
Kartamulia
Buroi
Tandjungradja
Kajuagung
SELO
Lembak
Prabumulih
TALANG DJIMAR
LIMAU
Kilet Wells
Tandjung
TANDJUNG MIRING
Tambangan
Muara Enim
KAMPONG MINJAK
ENIM
SUNGAI TAKAM
SUNGAI LANGU
SUBAN DJERIGI
Kataberu
Karangagung
Pagerdewa
Betung
Baturadja
104°
105°
3°

SHIRATSUKARI
Otaru
Sapporo
Hayakita
FURECHI
KARUMAI
KINAUSU
Muroran
PACIFIC OCEAN
Hakodate
TSUGARU STRAIT

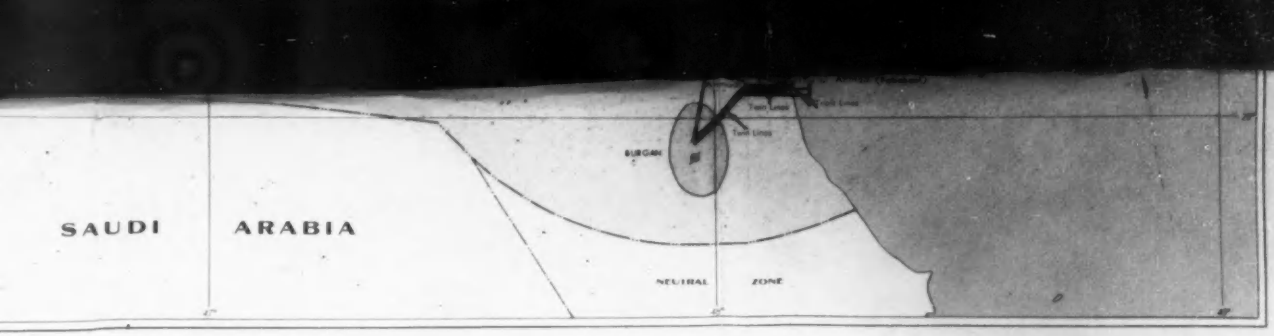
AKITA – YAMAGATA – NIIGATA FIELDS
OIL FIELDS
GAS FIELDS
Miles
Kilometers
SADO ISLAND
Niigata
SEKIYA
NIIGATA
SHIBATA
TSUKIOKA
NIITSU
JAPAN SEA
TERADOMARI
Sanjo
OMO
KENGAMINE
KOITA
AMAZE
OSAKI
ISHIJI
TOPIGOE
OGUCHI
HIGASHIYAMA
MIYIGAWA
NISHIYAMA
MIYAMOTO
Nagaoka
TAKAMACHI
IWATA
YASUDA
Kashiwazaki
KASHIWAZAKI
OJIYA
YONEYAMA
Naoetsu
MINAMOTO
GOTSU
KUWAZONE
Takada
MATSUNOYAMA
MAKI
NADOCHI
ODAGIRI
Nagano
JAPAN
Hiroshima
Yawata
Takuyama
Fukuoka
SHIKOKU
Matsuyama
Kochi
KYUSHU
Nagasaki
Shimizu
Kobe


Dizful
Lali
Isfahan
I R A N
Yezd
Abadan
Fao
KUWAIT
NEUTRAL TERRITORY
American Independent Oil Co. ½
Pacific Western Oil Co. ½
Bushire
Shiraz
Kerman
Expropriated
Anglo-Iranian Oil Co., Ltd.
Concession
Jubail
PERSIAN
Bahrein Petroleum Co., Ltd.
BAHREIN
GULF
Bandar Abbas
Riyadh
Dhahran
Daha
QATAR
Petroleum Development (Qatar), Ltd.
Petroleum Development (Trucial Coast), Ltd.
Arabian-American Oil Co. Preferential Rights
TROPIC OF CANCER
TRUCIAL OMAN
GULF OF OMAN
SAUDI ARABIA
Muscat
OMAN
Petroleum Development (Oman & Dhofar)
Arabian American Oil Co.
Petroleum Concessions, Ltd.
HADHRAMAUT
Mukalla
INDIAN OCEAN
A WORLD OIL Map

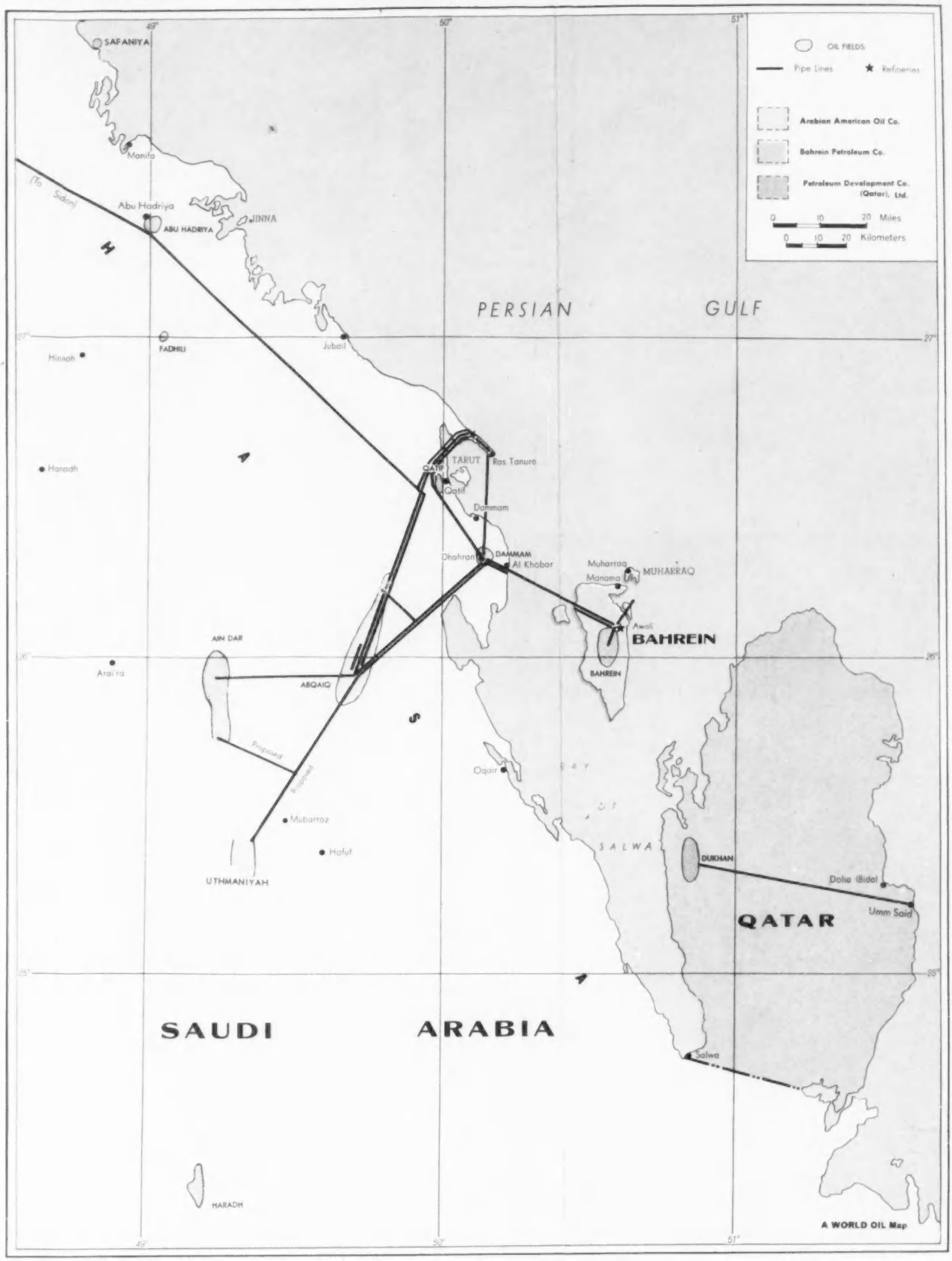
WORLD OIL Map

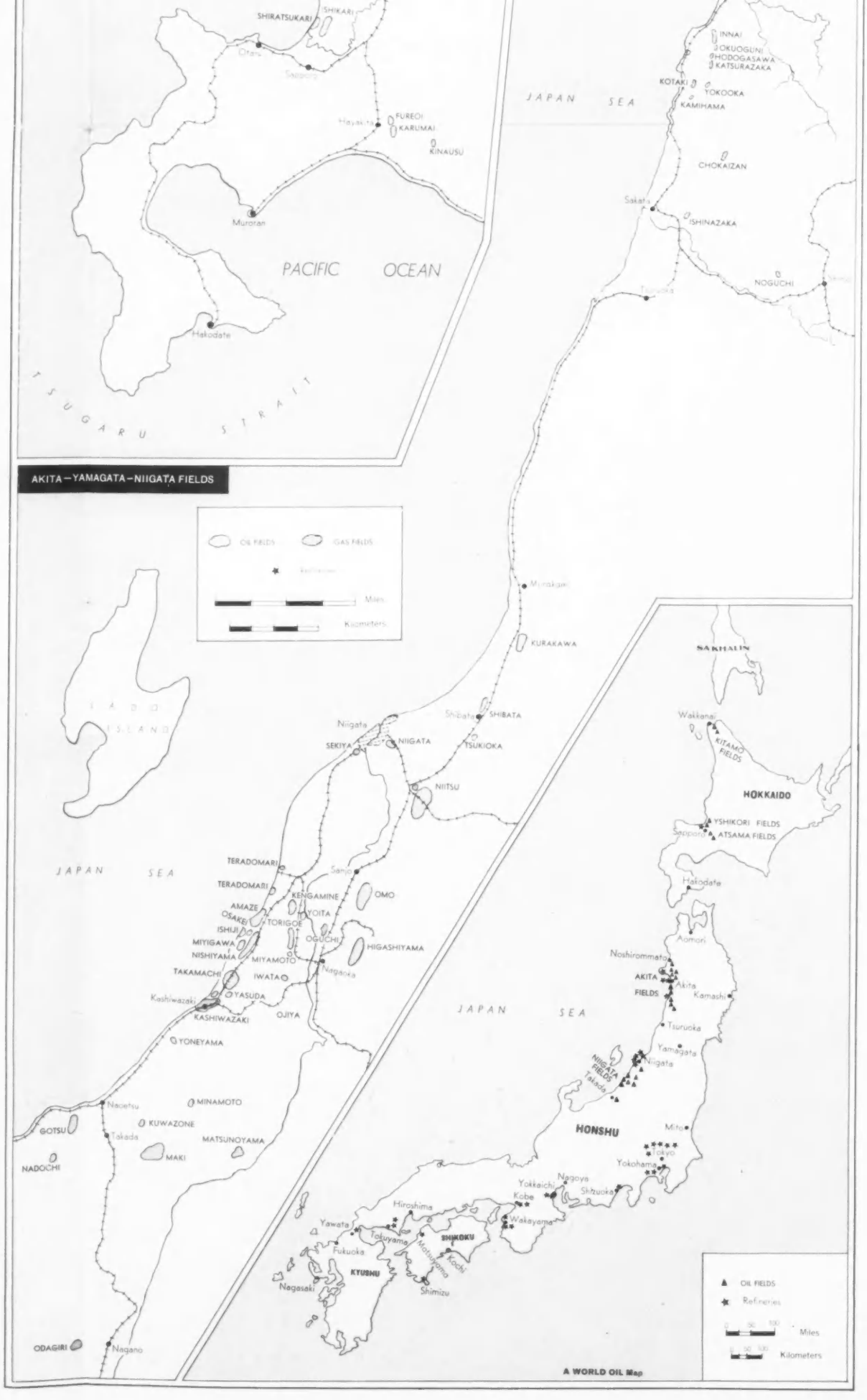
JAPAN

HOKKAIDO FIELDS
OIL FIELDS
GAS FIELDS
Refineries
Miles
Kilometers
Wakkanai
WAKKANAI
YUCHI
KOTOTOYA
MASUPORO
MENASHI
KITATOYOTOMI
JAPAN SEA
Asahigawa
SHIRATSUKARI
SHIKARI
NISHI HACHIMORI
HIGASHI HACHIMORI
IWAKO
SAWAME
Noshiro
ASANAI
HIBIKI
HAMAGUCHI
Lake Hachiro
Funakawa
TOYOKAWA
URAYAMA
KUROKAWA
MICHIKAWA
ASAHIGAWA
YABASE
Akita
KINSHOJI
NIIDA
KATSURANE
TOYOIWA
HANEKAWA
KATSUTE (KATTE)
UCHIMICHIKAWA
OSAZAWA
MATSUGASAKA
ISHIWAKI
Hiroo
INNAI

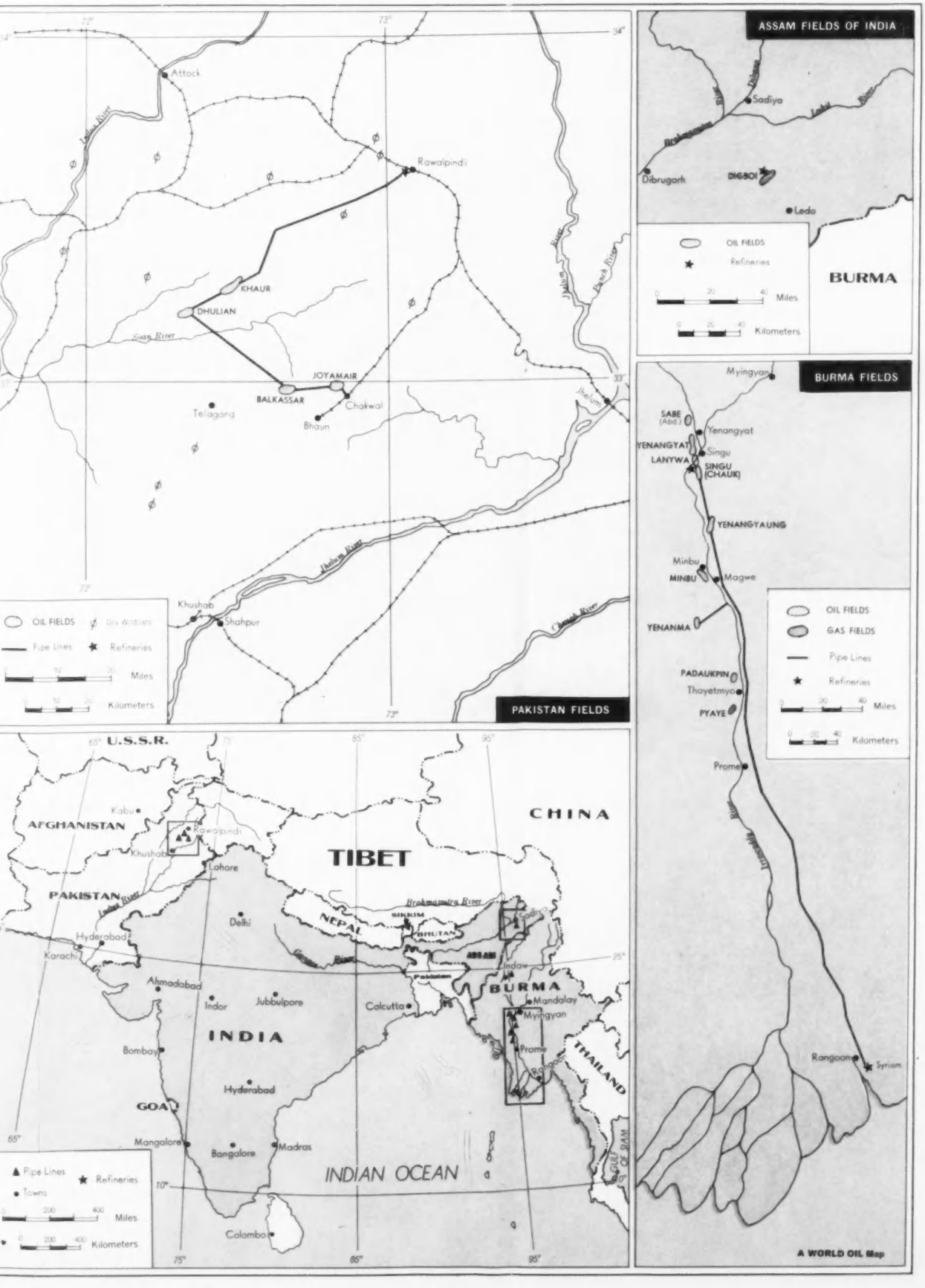


SAUDI ARABIA-BAHREIN-QATAR




AKITA – YAMAGATA – NIIGATA FIELDS
OIL FIELDS
GAS FIELDS
Refineries
Miles
Kilometers
PACIFIC OCEAN
JAPAN SEA
TSUGARU STRAIT
SHIRATSUKARI
SHIKARI
Otaru
Sapporo
Hayakita
FUREOI
KARUMAI
KINAUSU
Muroran
Hakodate
INNAI
OKUOGUNI
HODOGASAWA
KATSURAZAKA
KOTAKI
YOKOOKA
KAMIHAMA
CHOKAIZAN
Sakata
ISHINAZAKA
NOGUCHI
Tsuruoka
Murakami
KURAKAWA
SHIBATA
Shibata
Niigata
SEKIYA
NIIGATA
TSUKIOKA
NIITSU
SADO ISLAND
TERADOMARI
Sanjo
OMO
KENGAMINE
YOITA
AMAZE
OSAKEI
ISHIJI
TORIGOE
OGUCHI
HIGASHIYAMA
MIYIGAWA
NISHIYAMA
MIYAMOTO
Nagaoka
TAKAMACHI
IWATA
YASUDA
Kashiwazaki
KASHIWAZAKI
OJIYA
YONEYAMA
Naoetsu
MINAMOTO
KUWAZONE
GOTSU
Takada
MATSUNOYAMA
MAKI
NADOCHI
ODAGIRI
Nagano
SAKHALIN
Wakkanai
KITAMO FIELDS
HOKKAIDO
YSHIKORI FIELDS
ATSAMA FIELDS
Sapporo
Hakodate
Aomori
Noshirommata
AKITA FIELDS
Akita
Kamashi
Tsuruoka
Yamagata
Niigata
NIIGATA FIELDS
Takada
HONSHU
Mito
Tokyo
Yokohama
Nagoya
Shizuoka
Yokkaichi
Kobe
Wakayama
Hiroshima
Yawata
Tokuyama
Fukuoka
SHIKOKU
Matsuyama
Kochi
KYUSHU
Nagasaki
Shimizu
OIL FIELDS
Refineries
Miles
Kilometers
A WORLD OIL Map

PAKISTAN-INDIA-BURMA



ALASKA

Navy's Oil Search Results in Completion of 20 Wells; Presence of Commercial Production at Umiat Confirmed

THE navy's search for oil in Alaska's Naval Petroleum Reserve 4 was pressed throughout 1951 with the completion of 20 wells. Three tests found oil, three discovered gas and 14 were failures. In 1950, 12 tests led to three oil wells, a single gasser and eight dry holes. An increased tempo in exploration in this area above the Arctic Circle was further indicated by footage drilled in 1951 of 57,116 feet. This was 24,224 feet more than in 1950. Two wells were drilling as the year ended.

Presence of an oil field at Umiat, on the Colville River, was confirmed in 1951. Estimated recoverable reserves there range from 30 million to 100 million barrels of oil within the presently known field limits.

Natural gas discoveries, particularly in the Gubik area, indicate gas reserves in the Navy's prospective area may prove of commercial or military value. Gubik field gas reserves have been put at 900 billion cubic feet.

The Navy's exploration program, going on since 1944, is directed by Captain R. H. Meade, CEC, USN, director of Naval Petroleum Reserves. Field work is carried out under a Bureau of Yards and Docks contract by Arctic Contractors, Inc. A Navy oil unit of the United States Geological Survey is handling geological work. The survey's branch of military geology, cooperating with the Defense Department, centered part of its 1951 intensified program on the study of Alaskan permafrost. Permafrost is a condition in which the ground is perpetually frozen from the surface down several inches, thawing out only occasionally.

Still more geological exploration work is needed in Alaska, since only 49 percent of the territory has been mapped by reconnaissance methods. And less than one percent has been mapped in detail. The likely oil area covers 250,000 square miles. Only 11,000 square miles of it have been adequately mapped.

Thirty-six gravity oil has been found in the Upper Cretaceous sand of the Umiat anticline. Average thickness of the pay horizon is 85 feet. Two of the three oil wells drilled in 1951 were situated at Umiat.

The third successful test last year was drilled at Cape Simpson, where 20-gravity oil has been found in the Upper Cretaceous sand of a stratigraphic trap. Average thickness of Cape Simpson pay is 14 feet.

The Reserve's operating committee agreed late in 1951 that many untested prospects exist. Some of them are similar in geologic age to Umiat and Gubik structures. Others of different geologic age exist and should be tested, the committee agreed, before a reasonable evaluation of the Reserve can be made.

For 1952, the committee recommended this program approved by the undersecretary of the Navy:

- Drilling of five 4000-foot wells at Weasel Creek, Grandstand, Umiat, Wolf Creek and Square Lake.
- Seismic activities by three crews operating five months each.
- Surface geology program calling for one party in the Colville-Chandler area, another in the Sagavanirktok-Shaviovik sector and a third for selected locations of Lisburne limestone.

The Petroleum Reserve committee specifically recommended that Alaska exploration continue until a reasonable evaluation of oil-bearing potentials of the area, including public lands adjacent to the Reserve, has been determined.

CANADA

Alberta Contributes 98 of Western Canada's 108 Oil and Gas Fields Discovered During Record Year Past

WESTERN Canada's oil industry in 1951 broke all its oil and gas records. Then, $200 million was spent on exploration and development. Results not yet fully evaluated indicate the 1227 wells yielded 108 new oil and gas fields. And more than 200 of the wells were wildcats. Forty of the new fields were oil fields.

Alberta racked up most of these discoveries: 35 oil and 63 gas fields. Slightly more than 1150 wells were drilled in the province during 1951; with 739 oil producers, 101 gas wells and the remainder failures. In 1950, 970 wells resulted in 718 oil producers, 19 gas wells, 21 potential gas wells and 212 abandoned wells.

At the close of the year, the province had 2738 wells capable of producing. A year previous, this production capability extended to less than 2000 wells.

Alberta issued 1407 drilling permits in 1951, up 239 from 1950. Between 215 and 220 rigs were operating in Western Canada during the year, a marked increase from the estimated 140 active the previous year. Also, about 150 geophysical survey parties were engaged in the area.

Alberta's 1951 footage reached a new high of more than 5 million feet.

The province produced 46,915,384 barrels of oil. An increase of 18,773,290 barrels above 1950 yield of 28,142,094 barrels. A major factor in this remarkable hike was the new market created by the first full year's operation of the Interprovincial Pipe Line. Stretching from Edmonton to the Great Lakes, the line moved crude to eastern markets and refining centers. Important, too, was the

greatly enlarged refining capacity built during the year: an estimated 11,000-barrel-a-day rise in the Edmonton area, a 14,000 barrel hike at Winnipeg and 4000 barrels daily at Saskatchewan refineries.

End of the year found huge Redwater field, a 1948 discovery, almost drilled up. But some drilling continued along the west flanks. The field's 900 wells reached a daily output rate of 100,000 barrels during part of 1951. In doing that, they accounted for more than half of Alberta's total production.

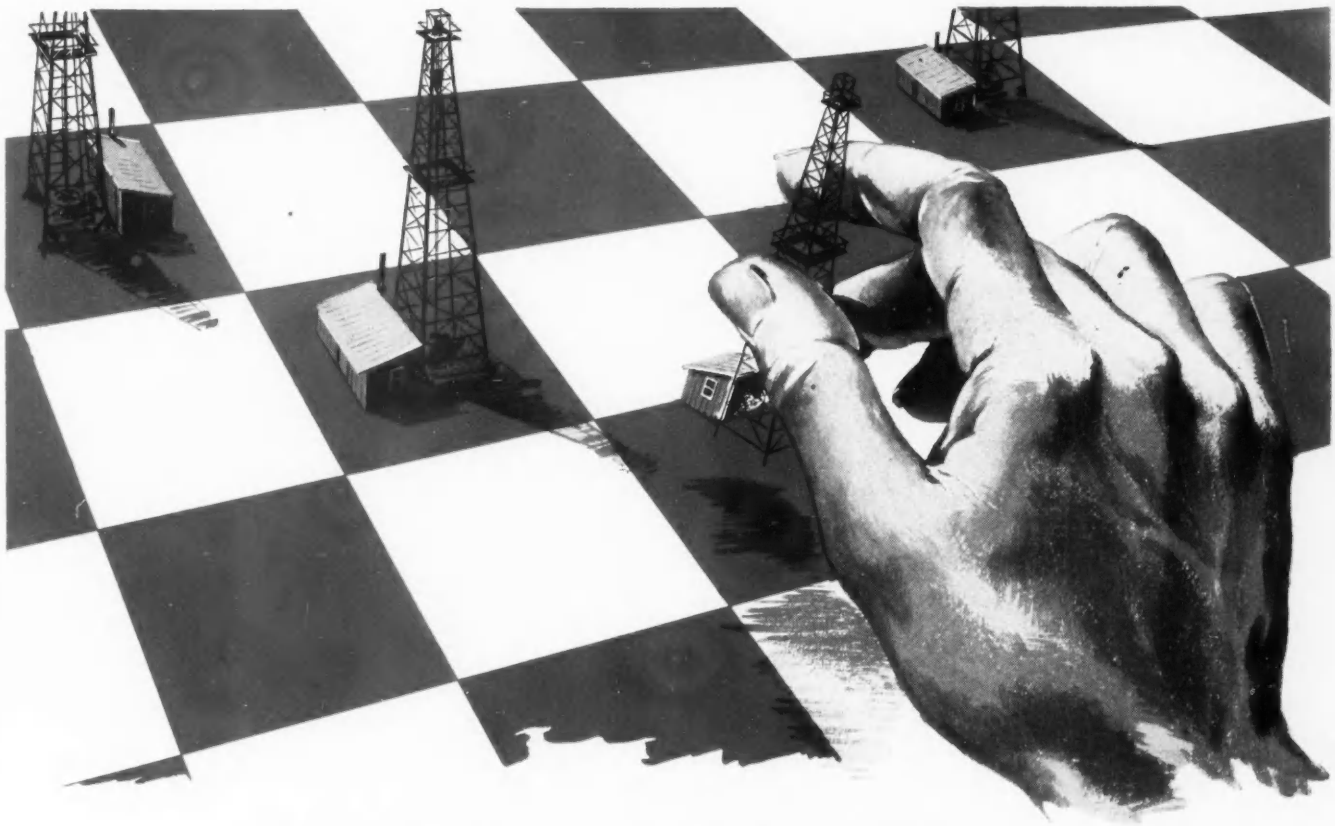
Signs pointing to the need for some form of repressuring program, possibly water injection, are increasing. Because the bottom hole pressure is declining rapidly.

Leduc-Woodbend-Calmar-Kavanagh area southwest of Edmonton was very active at year's end. Between 50 and 60 rigs were drilling. During August, 1951, production there accounted for almost 30 percent of Alberta's total. Many extensions and new pools have been found. Wizard Lake and Bonnie Glen pools were among the more important ones discovered during the year.

Principal 1951 Alberta discoveries centered in the "reef fairway," a prospecting area 200 miles wide and 1000 miles long. It extends in a general northwesterly-southeasterly direction across the province, continuing down across the southwestern corner of Saskatchewan and across the border into Montana. Most 1951 discoveries fell within the fairway's boundaries, with relatively shallow Lower Cretaceous sands and deeper D2

Drilling in Western Canada

PROVINCE and FIELD	WELLS COMPLETED IN 1950				WELLS COMPLETED IN 1951				
								TOTAL	
	Oil	Gas	Dry	Total Wells	Oil	Gas	Dry	Wells	Footage
ALBERTA:									
Acheson-Stony Plain	3	....	4	7	43	....	12	55	293,841
Alliance	....	....	....	....	3	....	3	6	17,097
Amisk Lake	....	....	....	....	....	2	....	2	6,838
Armena	....	....	....	....	9	....	3	12	41,830
Ashmont	....	....	....	....	....	....	3	3	4,859
Barons	....	....	....	....	2	....	6	8	33,445
Barrhead	....	....	....	....	....	1	....	1	3,976
Bashaw	....	....	....	....	3	....	1	4	29,261
Baxter Lake	....	....	....	....	1	....	1	2	4,542
Belloy	....	....	....	....	1	....	3	4	27,037
Big Valley	4	....	....	4	19	....	7	26	144,352
Bingville	....	....	....	....	....	1	....	1	1,350
Blackfoot	....	....	....	....	5	....	1	6	10,042
Bluesky	....	....	....	....	....	1	....	1	7,255
Bollogue Lake	1	....	....	1	....	....	1	1	3,478
Bon Accord	....	....	1	1	3	....	....	3	10,793
Bonnyville	....	1	....	1	7	1	6	14	17,358
Bow Island	....	1	....	1	....	....	....	....	....
Bremner	....	....	....	....	....	1	....	1	4,933
Bruderheim	....	....	1	1	....	....	1	1	4,511
Bulwark	....	....	2	2	....	....	3	3	10,071
Calmar	....	....	....	....	10	....	1	11	59,859
Campbell	8	....	3	11	8	1	2	11	44,943
Camrose	....	....	....	....	14	....	8	22	94,807
Caprona	....	....	....	....	2	....	....	2	11,528
Castor	....	....	....	....	....	1	....	1	3,715
Cessford	....	1	....	1	1	3	5	9	31,354
Clive	....	....	....	....	1	....	....	1	6,541
Countess	....	....	....	....	....	2	3	5	16,234
Craigmyle	....	....	....	....	....	2	....	2	8,764
Del Bonita (Milk River)	2	....	....	2	2	....	1	3	14,017
Denhart	....	....	....	....	....	1	....	1	2,904
Didsbury	....	....	....	....	1	....	1	2	10,553
Drumheller	....	....	....	....	2	....	4	6	32,846
Duhamel	....	....	....	....	6	....	2	8	36,001
Edgerton	....	....	....	....	....	....	1	1	2,776
Ellerslie	....	....	....	....	10	....	6	16	61,738
Elk Island	....	....	....	....	....	1	....	1	4,330
Excelsior	21	....	6	27	8	....	1	9	35,684
Gilbert	2	....	1	3	....	....	....	....	....
Glenevis	....	....	....	....	1	....	....	1	5,618
Golden Spike	3	....	1	4	4	....	1	5	31,396
Hamelin Creek	....	....	....	....	....	1	....	1	5,566
Hanna	....	....	....	....	....	....	1	1	3,854
Hardisty	....	....	....	....	....	....	1	1	3,280
Jarvie	....	....	....	....	....	1	....	1	3,152
Joseph Lake	20	....	....	20	45	....	9	54	184,989
Jumping Pound	....	....	....	....	....	3	....	3	30,236
Kavanagh	....	....	....	....	6	1	3	10	53,827
Lea Park	....	....	....	....	....	1	....	1	1,274
Leduc-Woodbend	157	....	15	172	277	....	8	285	1,603,367
Lily	....	....	....	....	....	....	1	1	3,305
Little Smoky	....	....	....	....	....	1	4	5	23,957
Lloydminster	25	1	5	31	44	3	8	55	107,484
Lost Point Lake	....	....	....	....	....	1	....	1	4,790
Majeau Lake	....	....	....	....	....	2	....	2	10,026
Manawan Lake	....	....	....	....	....	....	1	1	3,523
Manyberries	....	1	....	1	....	....	3	3	8,233
Many Islands	....	....	....	....	....	4	1	5	8,602
Medicine Hat	....	4	....	4	....	2	....	2	2,479
Morinville	....	....	....	....	....	6	5	11	52,240
Neapolis (Olds)	....	....	....	....	....	1	....	1	9,814
New Norway	....	....	....	....	4	....	2	6	32,840
Normandville	....	....	....	....	....	....	2	2	14,473
Oliver Lake	....	....	....	....	....	2	....	2	8,710
Picardville	....	....	....	....	....	2	....	2	5,657
Pinscher Creek	....	....	....	....	....	1	....	1	12,177
Pinhorn-Pakowki	....	....	....	....	....	....	4	4	11,869
Pouce Coupe	....	....	....	....	....	1	....	1	8,348
Provost	....	....	....	....	....	3	3	6	15,887
Ranfurly	....	....	....	....	....	....	2	2	2,109
Redwater	434	....	13	447	162	....	16	178	582,078
Scovil Lake	....	....	....	....	....	1	....	1	2,750
St. Paul	....	....	....	....	....	1	....	1	1,600
Sibbald	....	....	....	....	....	4	2	6	18,738
South Calmar	....	....	....	....	4	....	1	5	28,114
Southesk	....	....	....	....	....	3	2	5	22,675
Spring Coulee	2	....	....	2	1	....	....	1	6,024
Stettler	21	....	1	22	21	....	5	26	140,655
Steveville	....	....	....	....	....	1	1	2	6,536
Suffield	....	....	....	....	....	5	....	5	5,940
Sunnynook	....	....	....	....	....	2	....	2	7,511
Sylvan Glen	....	....	....	....	....	1	....	1	3,036
Taber	....	....	1	1	....	....	....	....	....
Tangent	....	....	....	....	....	4	1	5	16,424
Tolland	....	....	....	....	....	1	....	1	2,800
Turin	....	....	....	....	....	1	1	2	7,584
Turner Valley	2	1	1	4	....	....	....	....	....
Valleyview	....	....	....	....	....	1	....	1	5,003
Vermilion	....	....	....	....	....	2	....	2	4,020
Viking-Kinsella	....	8	....	8	....	11	....	11	23,903
Volmer	....	....	....	....	....	1	....	1	4,548
Wainwright	....	....	....	....	2	1	....	3	6,984
Waybrook	....	....	....	....	....	3	1	4	13,565
Westlock	....	....	....	....	....	1	....	1	4,280
Whitelaw	....	....	....	....	....	3	3	6	26,047
Whitemud	....	....	2	2	....	....	....	....	....
Wizard Lake	....	....	....	....	7	....	....	7	43,785
Wildcats	13	22	155	190	....	....	150	150	675,262
Total Alberta	718	40	212	970	739	101	328	1168	5,088,407
BRITISH COLUMBIA:									
Dawson Creek	....	....	....	....	....	3	1	4	13,220
Fort St. John	....	....	....	....	1	....	....	1	5,633
Peace River	....	....	....	....	....	....	3	3	11,667
Wildcats	....	....	5	5	....	....	7	7	33,618
Total British Columbia	....	....	5	5	....	3	11	14	64,138
MANITOBA:									
Linklater	....	....	....	....	1	....	....	1	2,945
Virden	....	....	....	....	4	....	....	4	15,676
Wildcats	....	....	1	1	....	....	5	5	18,983
Total Manitoba	....	....	1	1	5	....	5	10	37,204
NORTHWEST TERRITORIES:	....	....	....	....	....	1	1	2	3,732
SASKATCHEWAN:									
Brock	....	....	....	....	....	1	....	1	3,030
Coleville	....	....	....	....	4	1	....	5	15,217
Dahinda	....	....	....	....	....	....	1	1	6,850
Dodsland	....	....	....	....	....	1	1	2	7,404
Lloydminster Area	47	3	10	60	12	....	....	12	26,473
Wildcats	....	....	65	65	....	....	45	45	208,735
Total Saskatchewan	47	3	75	125	16	3	47	66	267,709
Total Western Canada	765	43	293	1,101	743	104	380	1,227	5,461,190



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and D3 reef zones of Devonian age the principal producing horizons.

Of outstanding importance among many discovereis was Texaco Exploration Company-McColl-Frontenac Oil Co., Ltd., multi-zone discovery at Wizard Lake—35 miles southwest of Edmonton and five miles southwest of Leduc-Calmar producing area. The discovery well proved the existence of 610 feet of 38-gravity oil saturated D3 Devonian reef zone pay section and 35 feet of light oil section in Basal Cretaceous sand.

Natural gas also was found in the Shallow Viking sand.

Western Canada Oil Production and Geological Data

PROVINCE and FIELD	Year of Discovery	PRODUCTIVE WELLS END OF 1951			CRUDE OIL PRODUCTION (Barrels)				Proved Area (Acres)	Gravity of Oil (API)	Formation Name and Kind	Geologic Age	DEPTH (Feet)		Type of Structure
		Producing	Shut In	Total	Daily End of 1951	Year 1950	Year 1951	Cumulative Through 1951					Min. to Top of Pay	Max. to Bottom of Pay	
Acheson-Stony Plain	1950	53	2	55	3,418	51,393	918,158	969,551	n.a.	36	Dev. Lime	Dev.	4969	5123	Reef
										36-37	L. Cret., Sand	Cret.	n.a.	n.a.	
Armelgra	1943	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	19	Ellis, Sand	Jur.	3100	n.a.	n.a.
Armena	1948	8	2	10	428	n.a.	16,856	18,040	n.a.	38	Dev. Lime	Dev.	4152	4174	n.a.
Armisie		4		4	202		25,293	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Athabaska (Gas)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	25,000		Labiche, Sand	Cret.	600	1300	Strat. Trap
Barons	1950	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	32	Bow Island, Sand	Cret.	n.a.	n.a.	n.a.
Barnwell (Gas)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5,000		Bow Island, Sand	Cret.	2150	n.a.	Monocline
Barrhead	1949		2	2		599	35	634	n.a.	24	Madison, Lime	Penn.	4008	4016	n.a.
Bashaw	1951	3	1	4	192		11,318	11,318	n.a.	38-43	D 3 Dev.	Dev.	n.a.	n.a.	Reef
Baxter Lake	1946	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	17	Wainwright, Sand	Cret.	n.a.	n.a.	n.a.
Big Valley	1950	21	1	22	1,193	10,215	155,580	165,795	n.a.	33	Dev., Lime	Dev.	5240	n.a.	Reef
Bolloque Lake	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	23	L. Cret., Sand	Cret.	n.a.	n.a.	n.a.
Bon Accord	1949	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	35	Dev., Lime	Dev.	3585	3608	n.a.
Bonnyville	1951	3	3	6	55		10,184	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Bow Island (Gas)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	10,000		Bow Island, Sand	Cret.	1900	2255	Dome
Brooks (Bantry)	1947	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	24	Bantry, Sand	Cret.	3253	3270	n.a.
Bulwark	1950	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Gas	Milk River, Sand	Cret.	1190	1250	Strat. Trap
Campbell	1949	5	7	12	109	60,012	60,436		n.a.	35	n.a., Sand	Cret.	3704	3720	n.a.
Camrose	1951	6	2	8	238		46,222	46,222	n.a.	38	Vik., Sand	n.a.	n.a.	n.a.	n.a.
Conrad	1944	15	2	17	387	110,062	142,497	1,021,954	1,000	26	Ellis, Sand	Jur.	2960	3125	Trap
Craigmyle	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	34	Madison, Lime	Miss.	4024	4044	n.a.
Del Bonita	1939	7	2	9	114	12,668	30,344	96,047	200	36-38	Madison, Lime	Miss.	5054	n.a.	Anticline
Dina	1929	2	1	3	40	17,887	12,646	90,306	400	14-15	Meridian, Sand	Cret.	1680	1900	Trap
Duhamel	1950	12		12	631	n.a.	184,582	n.a.	n.a.	34	D-2, D-3, Dev.	Dev.	n.a.	n.a.	Reef
Ellerslie	1950	4		4	87	570	20,774	21,344	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Excelsior	1949	31	1	32	1,593	272,186	723,005	996,807	n.a.	35	n.a., Lime	Dev.	3854	3870	n.a.
Fabyan (Gas)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	200		Viking, Sand	Cret.	1585	1900	Strat. trap
Foremost (Gas)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5,000		Bow Island, Sand	Cret.	2050	2250	Anticline
Glen Park	n.a.	3		3	531	n.a.	22,443	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Golden Spike	1949	9		9	1,099	292,873	640,972	1,018,926	n.a.	36	Dev., Lime	Dev.	5362	5900	Coral Reef
Hanna	1948	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	33	Sunburst, Sand	Cret.	3700	3731	Strat. trap
Hay Lake	1946	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	100	30	Madison, Lime	Miss.	3094	n.a.	Dome
Joseph Lake	1949	65	5	70	2,858	168,855	727,936	932,649	3,000	36-38	Viking, Sand	Cret.	3264	n.a.	n.a.
Jumping Pound	1944	4	2	6	225	362	41,936	51,557	n.a.	46	Madison, Lime	Miss.	9900	n.a.	Anticline
Keho Lake	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	32	Bow Island, Sand	Cret.	3680	n.a.	Anticline
Keystone Valley (Gas)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.			Blairmore, Sand	Cret.	8500	n.a.	n.a.
Lac La Biche (Gas)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.			Viking, Sand	Cret.	780	810	n.a.
											Dev., Lime	Dev.	1544	1585	n.a.
Leduc-Woodbend	1947	779	21	800	40,913	10,604,456	13,743,118	39,066,166	15,000	39	Dev., Lime	Dev.	4900	5425	Coral Reef
Lisburn	1950	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Viking, Sand	Cret.	n.a.	n.a.	n.a.
Lloydminster	1940	156	67	223	2,516	809,801	900,469	3,495,469	20,000	10-19	Sparky, Sand	Cret.	1750	2000	Strat. trap
Medicine Hat (Gas)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	40,000		Medicine Hat, Sand	Cret.	900	1250	Strat. trap
Moose Dome	1937	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	200	47	Fairholme, Lime	Dev.	1534		Dome
New Norway	1951	5	1	6	435		20,664	20,664	n.a.	38	D-2, D-3, Dev.	Dev.	D-2, 4584, D-3, 4858	n.a.	Reef
Normandville	1949	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	39	Dev., Lime	Dev.	n.a.	n.a.	n.a.
Pakowki (Gas)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	25,000		Bow Island, Sand	Cret.	2000	2200	Strat. trap
Pincher Creek	1948	1	1	2	18		24,677	29,237	n.a.	57					
										wet					
										Gas	Madison, Lime	Miss.	11700	12500	Anticline
Princess	1940	10	6	16	306	122,909	92,189	802,703	200	34	Dev., Lime	Dev.	3980	4000	Dome
									200	26-28	Sunburst, Sand	Cret.	3177	n.a.	Strat trap
									200	26	Madison, Lime	Miss.	3300	3320	Strat. trap.
Provost	1946	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	21	n.a., Sand	Cret.	2525	n.a.	n.a.
										Gas	Viking, Sand	Cret.	2300	n.a.	n.a.
Ram River	1944	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Dev.	3000	n.a.	n.a.
Red Coulee	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	150	31	Vanalta, Sand	Cret.	2417	2475	Terrace
Redwater	1948	893	5	898	50,785	10,746,472	23,177,607	38,754,445	35,000	35	Dev., Lime	Dev.	3105	3303	Coral Reef
Saint Paul (Gas)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.		L. Cret., Sand	Cret.	1547	1570	n.a.
Simmons	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	35	Dev., Lime	Dev.	3087	3272	Coral Reef
Skiff	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Ellis, Sand	Jur.	3054	3080	n.a.
Spring Coulee	1950	4		4	25	4,604	9,297	13,901	n.a.	37-38	Madison, Lime	Miss.	5876	6050	n.a.
Stettler	1949	45		45	2,443	246,312	606,068	868,105	n.a.	27-31	Dev., Lime	Dev.	5097	5240	n.a.
									n.a.	31	L. Cret., Sand	Cret.	4200	4348	n.a.
Suffield	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2,000	n.a.	Med. Hat., Sand	Cret.	980	1130	Strat. trap.
Taber	1937	11	10	21	263	114,916	182,449	1,489,009	760	17-23	Taber, Sand	Cret.	3028	3260	Strat. trap.
Tilley	1942	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	27	Sunburst, Sand	Cret.	3170	n.a.	Strat. trap.
Turner Valley	1914	288	42	330	8,059	3,344,007	2,952,307	101,216,144	25,000	37-64	Madison, Lime	Miss	3400	9600	Anticline
Vermilion	1939	18	22	40	116	40,041	44,557	1,271,317	1,000	14	Vermilion, Sand	Cret.	1870	1980	Strat. trap.
Viking-Kinsella (Gas)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	250,000		Viking, Sand	Cret.	2100	2200	Strat. trap.
Volmer	1948	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Wainwright	1922	5	5	10	54	15,360	14,238	317,570	12,000	22	Wainwright, Sand	Cret.	2200	2300	Anticline
Whitelaw	1950	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	17-26	n.a., Sand	Tri.	3835	3905	n.a.
Whitemud	1949	3	1	4	38	45,437	25,803	97,746	n.a.	38	n.a., Sand	Cret.	4061	4092	n.a.
Wizard Lake	1951	8		8	1,576		190,595	190,595	n.a.	37.6	Basal Cret. and Dev.	Cret.-Dev.	n.a.	n.a.	Reef
Total	....	2,511	227	2,738	122,096	28,142,094	46,915,384	201,537,326	.....	....	.....	.....	.....	.....	.....

n.a.—Not available.

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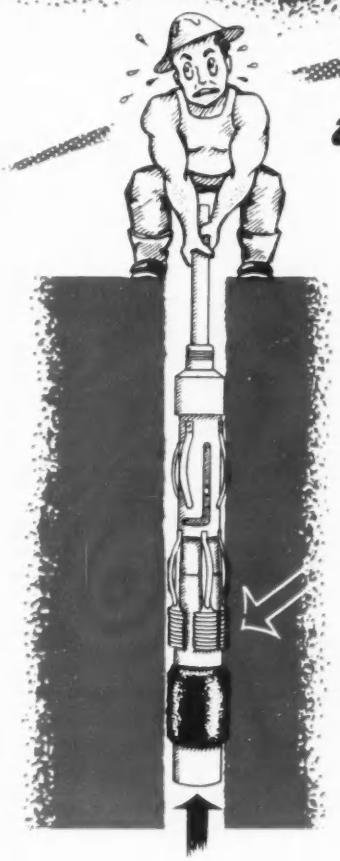
LARKIN of Butler "modified" UPSIDE DOWN PACKER

C-104



the more pressure you apply the tighter it gets

The Larkin "modified" UPSIDE DOWN PACKER operates very simply. Run it in to the point of pack then turn the tubing to the left until the body pin enters the vertical L slot. Pull tubing up and the packer is set. As the slips travel down the cone they wedge securely and stay put. Added pressure merely tightens the packer more.

REMOVES EASILY—2 WAYS

NORMAL REMOVAL. Lower tubing and turn it to the right. This engages the pin in the horizontal L slot. Pull up and out.

REMOVAL BY DISMANTLING. Left hand thread in manganese bronze base permits you to unscrew tubing nipple from packer body. Pull tubing out, allowing body pin to fall out. Using a combination socket, pull out slip assembly and packer body.

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Average depth of Wizard Lake D3 wells is about 6300 feet.

Other important reef discoveries included:

Drumheller—about 65 miles northeast of Calgary. The field produces from Devonian D2 dolomite at about 5400 feet and Lower Cretaceous at 4450 feet.

Lower Cretaceous pay was found in 1950, but the important D2 discovery was made in July, 1951. The D2 discovery was made by the Western-Dome-Naco team, which soon afterward made another strike a mile south of the original area. This field, with several D2 and three Lower Cretaceous wells completed in 1951, drew more interest early in 1952 with completion of two successful D2 extensions. One is situated a half mile northeast of the original area. The second is a mile west.

New Norway—about 50 miles southeast of Edmonton. This field produces from both the D2 dolomite and D3 reef. The dolomite pay section is 100 feet thick, the reef 60 feet. Canadian Superior of Canada, Ltd., made this two-zone reef fairway discovery in August.

The discovery well was completed in D3 for 230 barrels a day, at restricted rate, of 38-gravity crude. Total depth is about 5000 feet. With much offsetting acreage held by Sun Oil Company, Gulf Oil Corporation and Imperial Oil, Ltd., and new locations announced, rapid development of this field was expected.

Early in 1952, 111 feet of water-free D2 zone was found by a wildcat four miles southwest of the original New Norway area. That underscored the importance of the discovery well at New Norway.

Initially called Red Deer-New Norway, the latest discovery was made by the team of Scurry Oils, Ltd.-Central Explorers, Ltd.-Dragon Oil and Gas, Ltd.-Canadian Fina Oil, Ltd. Drillstem tests yielded 36.6-gravity oil. Later reports indicated the well was being drilled down to test the D3 zone.

In December, Texaco Exploration-McColl-Frontenac encountered what at first was believed to be the year's most important wet gas discovery. That was at a wildcat 6½ miles south of Wizard Lake. Subsequent drilling early in 1952 proved the well was a D3 zone oil discovery.

Top of the reef was found at 6382 feet, and more than 600 feet of zone was penetrated. The top 397 feet was a gas cap that yielded gas at rates exceeding 10 million cubic feet daily in addition to a big volume of distillate. Drillstem tests below the gas cap produced 42 gravity crude at 15-20 barrels an hour.

While this discovery is still being evaluated, it is expected to rate among 1952's most important developments.

Another wet gas discovery last year was Hudson's Bay Oil and Gas Company Neapolis (Olds) D3 discovery, about 35 miles north of Calgary. Initial tests showed potentials in excess of 60 million cubic feet a day plus 700 barrels of distillate. Well depth is 8100 feet. Subsequently, a followup test 1¾ miles southeast of the first well found the same zone 62 feet higher on structure.

Alberta in 1951 also marked up several new Viking and Basal Cretaceous sand discoveries in the Edmonton area. An important find was Armena, 30 miles southeast of Edmonton. Thirty-seven gravity oil was found at 3250 feet, with potentials as high as 400-500 barrels a day.

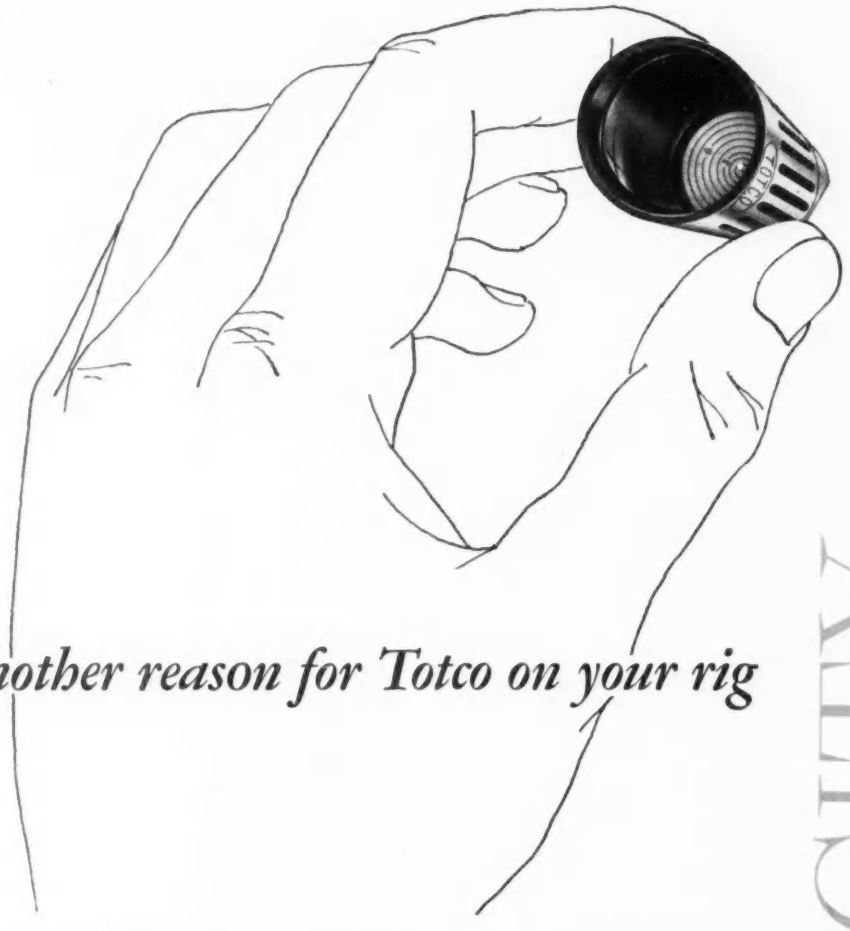
Highly significant in Canada's search for oil was the November discovery of 40-gravity oil at a wildcat about five miles south of Fort St. John along the Alaskan Highway. In a 90-minute drillstem test of a 20-foot section of Permo-Pennsylvanian limestone topped at 5633 feet, about 900 feet of oil was recovered. Right now, this discovery is of questionable commercial importance. But it culminated a 30-year search in the region. The wildcat was expected to spur British Columbia exploration during 1952.

Canada's reserve picture is bright. Growing gas reserves range between five to ten trillion cubic feet. The actual figure depends upon how the many one-well gas discoveries, capped for lack of markets, are evaluated. Canadian producers hope for approval of pipe lines to deliver gas to U. S. markets; but the only permits allowed thus far were for the Pakowki Lake-Shelby, Montana, line, which has been completed, and for the pipe line which will deliver gas to Pacific Northwest markets from Peace River area.

Crude reserves are mounting. Estimates of the total range from 1.5 to 3 billion barrels. Alberta production is currently restricted, but a new oil pipe crude line now

Drilling in Eastern Canada

PROVINCE, COUNTY, and TOWNSHIP	WELLS COMPLETED IN 1951					WELLS COMPLETED IN 1950				
				TOTAL					TOTAL	
	Oil	Gas	Dry	Wells	Footage	Oil	Gas	Dry	Wells	Footage
NEW BRUNSWICK:										
Stony Creek							3		3	2,836
Wildcats								2	2	9,259
ONTARIO:										
Elgin County:										
Aldborough	6		9	15	6,764		4	2	6	9,251
Bayham										
Dunwich							3	6	9	11,942
Malahide										
Southwold										
Yarmouth										
Essex County:										
Mersea							1		1	994
Haldimand County:										
Haldimand Field		70	25	95	78,429		71	37	108	88,812
Kent County:										
Camden, Camden Gore			1	1	1,766		1	4	5	5,825
Chatham, Chatham Gore		1	4	5	9,860		2	2	4	7,525
Orford			1	1	2,156			1	1	2,033
Raleigh	1			1	275	2		2	4	2,488
Romney							1		1	1,245
Zone							1	1	2	1,815
Lambton County:										
Bosanquet								1	1	390
Brooke	2		9	11	6,564	2		1	3	1,098
Dawn		1	7	8	16,112		1	2	3	5,875
Enniskillen						3		1	4	1,908
Euphemia	1		1	2	729	2		1	3	1,058
Moore		5	16	21	51,350	2	3	14	19	44,668
Plympton			1	1	2,308	3		4	7	3,893
Sarnia										
Sombra		4	17	21	46,735	7	2	8	17	34,474
Warwick										
Lincoln County:										
Caistor		5	1	6	2,939		7	2	9	4,156
Middlesex County:										
Metcalfe								1	1	1,824
Mosa	2			2	780		5		5	7,484
Norfolk County:										
Norfolk Field		24	29	53	65,228		19	16	35	41,972
Welland County:										
Welland Field		44	19	63	49,153		61	19	80	59,715
Oxford County		4	1	5	5,914					
Manitoulin Island						1		2	3	1,667
Other Areas							3	3	6	5,957
Kent City, Hawich Tp.			2	2	2,200					
Kent City, Howard Tp.			1	1	1,802					
Bruce City, Lindsay Tp.			1	1	1,582					
Essex City, Malden Tp.			2	2	2,034					
Total	12	158	147	317	354,680	22	188	132	342	360,409



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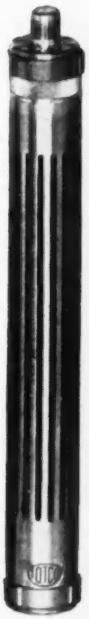

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PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION MEMBER

under construction from Edmonton to Vancouver, British Columbia, is expected to provide a substantial outlet. The line is expected to be built by late 1953 with initial capacity of 75,000 barrels daily. A boost in pumping capacity ultimately could deliver 200,000 barrels a day.

To handle crude from this line, Imperial Oil, Ltd., will spend $13.5 million to expand its Ioco, B. C., refinery —from 12,000 to 22,500 barrels a day.

Heavy oil reserves are rising, too. New fields were discovered in 1951 on north and south ends of Lloydminster field which straddles the Alberta-Saskatchewan border. At the year's end, heavy oil output reached 6000 barrels a day from more than 400 wells in the two-province area.

Heavy oil exploration increased during the year. Bigger demand for heavy fuels, asphalts and new refining facilities, particularly at Lloydminster, caused that. Nineteen hundred foot production has led several companies to the area.

Saskatchewan's oil importance spiraled during the year:

- A total of $8 million was spent on exploration, as compared to $2 million in 1950. And even that was expected to be doubled in 1952.
- Colville field was discovered. Royalite Oil Co., Ltd.-Albercan test discovery found 14-gravity oil at 2700 feet in Lower Cretaceous about 30 miles east of the Alberta border. By the end of 1951, about 15 wells were producing. Gas shows in shallower Viking sand indicate growing importance of the area.
- Dahinda field was discovered. Shell Oil Company found 33-gravity oil in Mississippian dolomite at 4700 feet in this area, 55 miles southwest of Regina. Though non-commercial, the discovery was significant due to higher gravity of the oil.
- Roseray field was discovered. Socony-Vacuum Oil Company, Inc., located 24-gravity oil at 3100 feet in Lower Cretaceous about 28 miles northwest of Swift Current. The discovery well initially flowed more than 300 barrels daily on drillstem tests.
- Brock field was discovered. Husky Oil and Refining, Ltd.-Phillips Oil Company, Ltd., found a prolific flow of gas in the Viking sand about 30 miles southeast of Colville. Development thus far has shown potentials of 20-40 million cubic feet of gas daily in this area.
- Twelve wildcat and development rigs were operating in Saskatchewan at year's end.
- During peak activity in 1951, 46 geophysical parties operated in the province. An increase to 70 in 1952 was expected.
- Twenty-six drilling rigs were operating in Saskatchewan at the close of 1951.

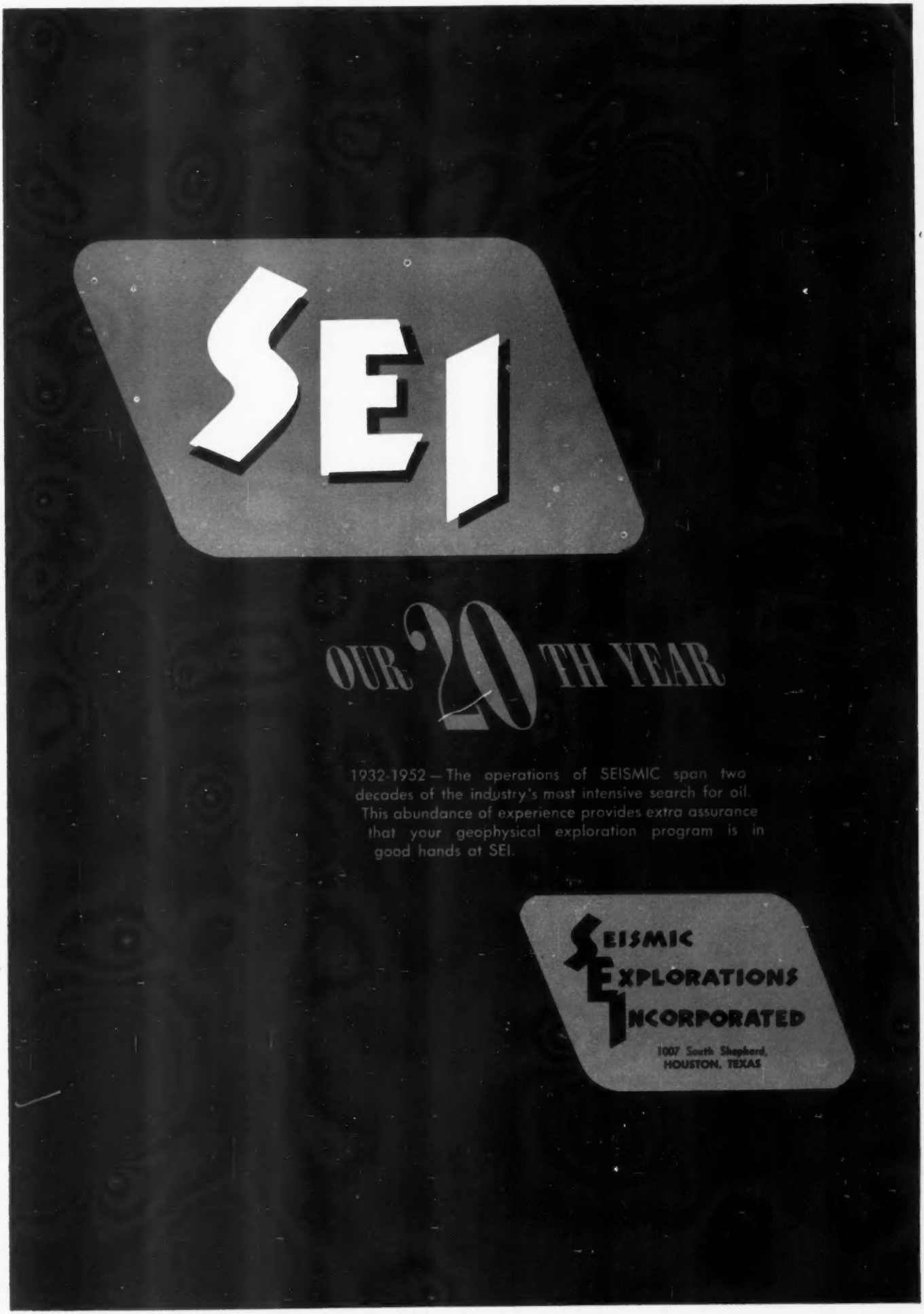
Oil play during the year extended to Manitoba, too.

Eastern Canada Oil Production and Geological Data

COUNTRY and FIELD	Year of Discovery	PRODUCING WELLS END OF 1951			CRUDE OIL PRODUCTION (Barrels)				Proved Area (Acres)	Gravity of Oil (API)	Formation, Name and Kind	Geological Age	DEPTH (Feet)		Structure
		Flowing	Art. Lift	Total	Daily Average for 1951	Year 1951	Year 1950	Cumulative Through 1951					Min. to Top of Pay	Max. to Bottom of Pay	
NEW BRUNSWICK:															
Stony Creek	1909	n.a.	n.a.	n.a.	n.a.	n.a.	16,883	n.a.	260	37.3	Albert, Sand	Miss.	1500	3000	Homocline
ONTARIO:															
Rothwell and Thamesville	1860 and 1895	n.a.	141	141	35	13,130	17,065	30,195	6,000	36	Dundee, Lime	Dev.	320	410	Dome and Anticline
Brant (Gas)	n.a.	...	...	...	...	...	...	...	n.a.	...	Medina-Cataract, Lime, Sand	Sil.	360	532	Monocline
Brooke	1909 and 1934	n.a.	4	4	...	745	1,000	4,957	800	39	Dundee, Lime	Dev.	325	465	Domes
Chatham	n.a.	...	...	...	...	...	...	...	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Dawn and Euphemia	1886, 1897, 1932	n.a.	5	5	3	1,370	1,920	80,630	700	40	Dundee, Lime	Dev.	320	370	Domes
		...	...	...	...	...	...	...	600	38	Guelph-Salina, Dol.	Silv.	1815	1950	Dome
Dover and Raleigh	1917	n.a.	7	7	9	3,310	3,714	222,962	900	36	Trenton, Lime	Ord.	2950	3300	Fault
Dunwich*	1898	n.a.	23	23	4	1,793	1,766	203,019	500	36	Dundee, Lime	Dev.	3300	400	Dome
Elgin (Gas)	n.a.	...	...	...	...	...	...	...	n.a.	...	Clinton, Lime	Sil.	1250	1400	Monocline
Essex	n.a.	...	...	...	...	...	...	...	2,000	40	Guelph-Salina, Dol.	Sil.	900	1100	Anticline
Haldimand-Norfolk (Gas)	n.a.	...	...	...	...	...	...	...	145,000	...	Medina-Cataract, Lime, Sand	Sil.	350	900	Monocline
		...	...	...	...	...	...	...	189,000	...	Clinton, Lime	Sil.	870	1200	Lens
Kent (Gas)	n.a.	...	...	...	...	...	...	...	15,000	...	Guelph-Salina, Dolo.	Sil.	1200	1400	Dome
Lincoln (Gas)	n.a.	...	...	...	...	...	...	...	5,400	...	Medina-Cataract, Lime, Sand	Sil.	315	500	Monocline
Middlesex (Gas)	n.a.	...	...	...	...	...	...	...	200	...	Grimsby, Lime	Sil.	1450	1500	Monocline
Moore	1904	n.a.	7	7	...	197	103	435,557	4,000	36	Dundee, Lime	Dev.	410	470	Anticline
Mosa*	1904	n.a.	165	165	40	14,935	15,495	579,495	4,000	37	Dundee, Lime	Dev.	360	385	Dome
Oil Springs	1859	n.a.	645	645	72	26,580	25,310	8,183,930	1,000	38	Dundee, Lime	Dev.	370	400	Dome
Onondaga	1910	n.a.	5	5	...	46	70	34,732	1,920	39	Medina-Cataract, Sand	Sil.	480	650	Monocline
Petrolia and Enniskillen	1865	n.a.	426	426	107	39,027	40,950	16,437,240	8,000	36	Dundee, Lime	Dev.	460	510	Dome and Anticline
Plympton	1875	n.a.	...	...	...	...	130	170,268	3,000	36	Dundee, Lime	Dev.	480	510	Anticline
Sarnia	1875	n.a.	4	4	...	144	114	315,603	4,500	36	Dundee, Lime	Dev.	480	510	Anticline
Sombra	1946	37	...	37	242	88,651	141,400	459,126	2,000	38	Salina, Dolomite	Sil.	1825	1900	Dome, Flanks
Warwick, Metcalfe, and Adelaide	1938	n.a.	9	9	3	1,380	2,025	124,930	4,000	38	Dundee, Lime	Dev.	370	440	Domes
Welland (Gas)	n.a.	...	...	...	...	...	...	...	38,000	...	Medina, Lime	Sil.	400	910	Monocline
Wentworth	n.a.	...	...	...	...	...	...	...	6,000	n.a.	Clinton, Lime	Sil.	300	440	Monocline
Moore	1947	4	1	5	...	1,506	828	2,853	200	38-40	Salina, Dolomite	Sil.	2180	2380	Flank
Aldborough	1949	n.a.	9	9	...	4,050	1,546	6,743	200	37	Dundee, Lime	Dev.	355	450	Domes
Raleigh	1920	n.a.	4	4	...	298	419	n.a.	200	38.5	Dundee, Lime	Dev.	255	275	Dome
Total	...	41	1,455	1,496	515	197,142	270,738	27,292,242	...	...	...	...	...	...	...

n.a.—Not Available.

* Predominantly a gas field.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There, significant oil discoveries were reported:

Virden—California Standard discovered light oil about 50 miles west of Brandon. The discovery well was drilled to 5300 feet, then plugged back to 2330 feet for a production rate of 100 barrels daily of 33-gravity oil in Mississippian limestone. Several more wells were drilled in at Virden, but none had initial production equaling that of the discovery.

Exploration—Wildcatting and some wide stepouts are currently underway by Standard Oil Company of California and Canadian Superior Oil of California, Ltd.

Operating rigs—At the close of 1951, five rigs were drilling in Manitoba, up four from a year previous.

Importance of Manitoba is heightened by subsequent discovery of high gravity oil by Amerada Petroleum Corporation in the Williston Basin of North Dakota.

Britalta Petroleums, Ltd., of Calgary announced in 1952 that negotiations with the government of Saskatchewan for drilling rights on 1,059,520 acres of Saskatchewan crown land had been completed. Negotiations were begun early in the year.

Britalta acquired the million-acre lease from a Regina, Sask., resident, with the company obtaining all interest in the land except a 2½ percent overriding interest.

The Britalta lease extends from Saskatoon to Prince Albert, Sask., and is contained in a block approximately 78 miles north and south and 48 miles east and west. The agreement will run to April 30, 1954.

Magnetometer and gravity meter surveys were carried out earlier on Britalta's Saskatchewan acreage, and the company was completing plans to commence drilling operations in 1952.

REFINERIES OF CANADA

The British American Oil Co., Ltd.: 5500-barrel-a-day, skim-crack-asphalt refinery at Edmonton, Alta.
7200-barrel-per-day, skim-crack-asphalt refinery at Calgary, Alta.
2200 barrels daily skim-crack refinery at Brandon, Man.
7200-barrel-a-day skim-crack-asphalt refinery at Brandon, Man.
6000 barrels a day skim-crack-asphalt refinery at Moose Jaw, Sask.
40,000-barrel-per-day skim-crack-asphalt refinery at Montreal—East, Que.
17,000-barrel-a-day complete refinery at Clarkson, (Toronto), Ont.

Imperial Oil, Ltd.: 9200-barrel-per-day skim-crack-asphalt refinery at Calgary, Alta.
30,000-barrel daily skim-crack-distillation unit-gas recovery refinery at Edmonton, Alta.
20,000-barrel-per-day skim-asphalt-crack refinery at Regina, Sask. Planned expansion expected to be completed in 1954 will increase crude capacity to 22,500 barrels per day.
55,500 barrels daily complete refinery at Sarnia, Ont. Expansion scheduled to be completed by end of 1952 will increase crude capacity to 71,000 barrels a day.
1250 barrels daily skimming plant at Norman Wells, Northwest Territories.
12,000-barrel skim-crack refinery at East St. Paul, Man.
22,500 barrels daily skim-crack-asphalt refinery at Ioco, B. C.
46,000 barrels a day skim-crack-asphalt-lube refinery at Montreal—East, Que.
3200-barrel daily skim-crack-asphalt refinery at Imperoyal, 2 miles from Dartmouth, N. S.

Lion Refining Co.: 750-barrel-a-day skimming plant at Calgary, Alta.

Supreme Refineries, Ltd.: 500-barrel-a-day skim-crack refinery at Ogden, Alta.

Wainright Refineries, Ltd.: 300 barrels daily skimming plant at Wainright, Alta.

McColl-Frontenac Oil Co.: 5500-barrel-per-day skim-crack refinery at Edmonton, Alta.
40,000-barrel-per-day skim-crack refinery at Montreal—East, Que.
12,000-barrel-a-day skim-crack refinery at Toronto, Ont., which was shut down in 1949.

Shell Oil Co. of Canada, Ltd.: 8500-barrel daily skim-crack-asphalt refinery at Shellburn, B. C.
8350-barrel-a-day skim-asphalt refinery at Burnaby, B. C.
25,000 barrels per day skim-crack refinery at Montreal—East, Que.

General Petroleum Refineries: 300-barrel daily skimming plant at Pointe-aux-Trembles (Montreal), Que.

New Brunswick Oilfields, Ltd.: 300 barrels daily skimming plant at Weldon, N. B.

Sun Oil Co.: 15,000-barrel-per-day cracking plant at Sarnia, Ont.

Franco Oils, Ltd.: 3000-barrel-a-day dehydration, desalting refinery at Vermilion, Sask.

HiWay Refineries, Ltd.: 3650-barrel-per-day skim-crack-asphalt refinery at Saskatoon, Sask.
350 barrels daily skimming plant at Rosetown, Sask.
1200-barrel daily skimming plant at Moose Jaw, Sask., idle in 1951.

Excelsior Refineries: 3000 barrels daily skim-crack-asphalt refinery at Lloydminster, Alta.

Gas & Oil Refineries, Ltd: 2500-barrel daily skim-crack refinery at Hartell, in Turner Valley field of Alberta.

Husky Oil and Refining, Ltd.: 10,000-barrel-a-day skim-asphalt-dehydration refinery at Lloydminster, Alta.
1200-barrel-per-day dyhydration, desalting refinery at Borradaile, Alta.
7500 barrels daily skimming-asphalt refinery at Lloydminster, Alta.

Trump Oil Company, Ltd.: 300 barrels daily skimming plant at Morris, Man.

North Star Oil, Ltd.: 4200-barrel-per-day skim-crack refinery at St. Boniface, Man.

Radio Oil Refineries, Ltd.: 1200-barrel-a-day skimming plant at East Kildonan, Man.

Trinidad Leaseholds, Ltd.: 6200-barrel-per-day skim-crack refinery at Port Credit, Toronto, Ont.

Canadian Oil Companies, Ltd.: 20,000-barrel-per-day skim-crack-polym. refinery at Petrolio, Ont., under construction.
20,000-barrel per day cracking plant at Froomfield.

Moose Jaw Refineries: 2000-barrel daily skimming plant at Moose Jaw, Sask.

Prince Albert Refineries, Ltd.: 1000-barrel-per-day skimming plant at Prince Albert, Sask.

Saskatchewan Federated Cooperatives, Ltd.: 5000-barrel-a-day skim-crack-asphalt refinery at Regina, Sask.

Northern Petroleum Corp.: 800-barrel daily skimming plant refinery at Kamsack, Sask.

PIPE LINES OF CANADA

Edmonton Pipe Line Co.: 2900-barrel-a-day, 20-mile, 6-inch crude line from Joseph Lake-Viking fields to Edmonton, Alta.

B-A Saskatchewan Pipe Line Co., Ltd.: 21-mile, 6-inch crude line from Interprovincial's line near Moose Jaw, Sask., to Moose Jaw.

Imperial Pipe Line Co., Ltd.: 8-mile, 8-inch line from Leduc field, Alta., to Nisku.
20-mile, 8-inch crude line from Nisku to Edmonton, Alta.
6-mile, 4-6-inch crude line from Simmons area to Redwater field in Alberta.
10-mile, 8-inch crude line from Woodbend field to Ellerslie in Alberta.

Imperial Oil Co.: 165-mile, 10-inch crude line from Sarnia to Toronto, Ont., under construction.

Interprovincial Pipe Line Co., Ltd.: 95,000-barrel-a-day 1150-mile, 16-18-20-inch crude line from Edmonton, Alta., to Superior, Wis. Proposed addition of six pump stations and a 100-mile loop in the 16-inch section between Regina, Sask., and Gretna, Man., is designed to increase capacity to 135,000 barrels daily.
30-mile, 16-inch crude line from Redwater field to Edmonton, Alta.

Standard Development Co.: 5-mile, 4-inch crude line from Conrad field to Conrad, Alta.
4-mile, 3-inch crude line from Princess field to Princess, Alta.

Valley Pipe Line Co.: Two 30-mile, 4-inch and one 31-mile, 6-inch crude lines from Turner Valley field to Calgary, Alta.
Turner Valley field gathering lines consisting of a total of 105 miles of 2-3-4 inch crude lines.

Winnipeg Pipe Line Co., Ltd.: 75-mile, 10-inch crude line from Interprovincial line at Gretna, Man., to Winnipeg, Man.

Trans-Northern Pipe Line Co.: 40,000-barrels daily, 100-mile, 10-inch products line from Montreal, Que., to Hamilton, Ont., serving Cornwall, Prescott, Brockville, Kingston, Port Hope, Toronto, and Clarkson projected. A 44-mile, 6-inch line will serve Ottawa.

Texaco Exploration Co. and McColl Frontenac Oil Co.: 12,000-barrel-per-day 8-inch, 42-mile crude line from Wizard Lake field to Edmonton, Alta.

Trans Mountain Oil Pipe Line Company: 75,000-barrel-a-day, 751-mile, 24-inch crude line from Edmonton, Alta., area to Vancouver, B. C. under construction. Maximum capacity placed at 200,000 barrels daily.

Canadian Montana Gas Co.: 66-mile gas line from Pakowki field to Cut Bank, Mont., planned.

Canadian Western Natural Gas, Light, Heat, & Power Co.: 170-mile, 16-inch gas line from Bow Island field in Alberta to Calgary, Alta.
41 miles of 3-8-inch gathering system composed of branch lines to various towns on Bow Island-Calgary system served from Turner Valley.
30-mile, 10-inch gas line from Foremost to Bow Island, Alta.
28-mile, 10-inch gas line from Turner Valley field to Calgary, Alta.
16-mile, 14-inch gas line from Turner Valley field to De Winton, Alta.
15-mile, 6-inch gas line from Turner Valley field to Okotoks, Alta.

Franco Utilities, Ltd.: 5-mile, 4-inch gas line from Vermilion field to Vermilion, Alta.

Northwestern Utilities, Ltd.: 10-mile, 10-12-inch gas line from Kinsella to Viking in Alberta.
77-mile, two 12-inch gas lines from Viking to Edmonton, Alta.
20-mile, 4-inch gas line from branches on Kiking-Edmonton line to Vegreville, Alta.
70-mile, 8-inch gas line from branches on Viking-Edmonton line to Ponoka, Alta.
30-mile, 6-inch gas line from Ponoka to Red Deer, Alta.

Wainright Gas Co.: 8-mile, 4-inch gas line from Fabyan to Wainright, Alta.

Dominion Natural Gas Co.: 175-mile, 8-, 10-, and 12-inch line from Tilbury to Hamilton, Ont.
30-mile, 8-inch gas line from Tilbury to Kingsville, Ont.
50-mile, two-10-inch gas lines from Haldimand to Hamilton, Ont.

Union Natural Gas Co. Canada:
60-mile, 10-inch gas line from Dawn to London, Ont.
50-mile, two 10-inch gas lines from Tilbury to Windsor, Ont.
55-mile, 10-inch gas line from Tilbury to Sarnia, Ont.
7-mile, 16-inch gas line from Windsor to Detroit, Mich.
61-mile, 16-inch gas line from Windsor to Dawn, Ont.

Montreal Pipe Line Co.: 70-mile, 18-inch gas line from North Troy, Vt., to Montreal, Que.

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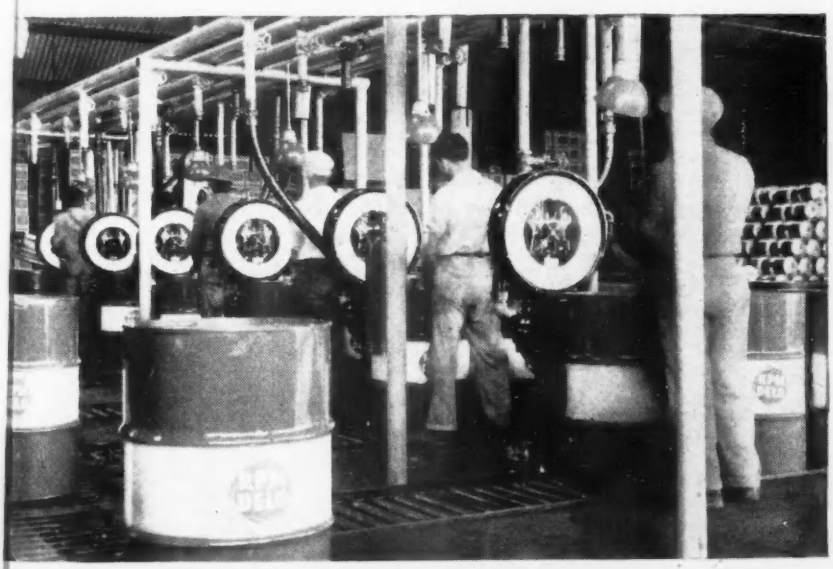

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MEXICO

Pemex Falls Short of Goals But Increases Production 5 Million Barrels and Has Biggest Completions Year

PETROLEOS Mexicanos fell short of its announced goals for 1951:

- Crude production was not increased 80,000 barrels a day.
- Well completions marked up a modest, not sharp, rise.

Crude output totaled 77,090,000 barrels in 1951, up 4,972,402 from 1950, or a 1951 daily average of 211,206 barrels, an increase of 13,626 from 1950's daily average output of 197,580.

Production at the close of 1951 reached 214,433 barrels a day, or 16,853 more than the daily average for 1950.

Well completions numbered 268—Pemex's banner drilling year and an increase of 51 over the previous year. Months-long floods in the Panuco-Ebana area of Tampico region and in Tehuantepec Isthmus fields limited drilling.

Wells drilled in 1951 were almost evenly divided between producers and failures: 135 to 133. As of December 31, 7550 wells had been drilled in Mexico—3142 producers and 4408 failures. Of this cumulative number, Pemex has drilled 1018, of which 555 were producers and 463 failures.

Main Belt (Golden Lane) drilling accounted for 75 of the 1951 wells, Tampico-Panuco area 63, and Saline Basin 44.

Of the year's 135 successful completions, 122 were oil producers and 13 were gassers. Poza Rica accounted for 17 oil wells, Northern District 29, Southern District 59, Isthmus of Tehuantepec 29, and Northeastern Mexico 5. Northeastern Mexico, however, accounted for 12 of the 14 gas producers completed during the year.

Poza Rica also led in amount of footage drilled in 1951—281,914 feet out of a total footage in Mexico for the period of 1,100,076 feet.

Crude reserves at the end of 1951 were pegged at 1,168,798,000 barrels, up 321,072,000 over the previous year. Total accumulated production at year's end reached 2,583,177,000 barrels.

Other Pemex accomplishments in 1951 included:

- Discoveries of Jose Colomo oil field in Tabasco State, considered most important in years; Rabon Grande and Concepcion oil fields in Isthmus zone of Veracruz; Trevino oil field and Lomitas gas field in Tamaulipas State and Tamiahua oil field in north zone of Veracruz State.
- Contract for export sale of 1 million barrels of crude from Rabon Grande field. First shipment of 65,164 barrels was sent to the U. S. December 2.
- Completion of 155-mile pipe line across Tehuantepec Isthmus. Its 15,000 capacity can be doubled by installation of an intermediate pump station.
- Completion of a 25-mile gas pipe line from Monterrey to Cementos Hidalgo and a 25-mile section of the 212-mile Monterrey-Torreon gas pipe line.

Partly in view of limited success of the 1951 program, Pemex's 1952 budget will be $230,800,000, a rise of $44,300,000 from 1950 expenditures.

MEXICO PIPELINES

Petroleos Mexicanos: 30,000 barrels daily, 35-mile, 8- and 10-inch crude line from Ebano-Panuco fields to Tampico. Also 144 miles 4-, 6- and 10-inch crude lines from Ebano-Panuco fields to gathering lines.
50,000 barrels-per-day, 147-mile, 10-inch crude line from Poza Rica field to Mexico City.
30,000 barrels daily, 287-mile, 12-inch crude line from Poza Rica field to Salamanca.
125,000 barrels daily, 39-mile, 6-, 8- and 12-inch (in series) crude lines

Engineering and Geological Data on Mexico

STATE and FIELD	Est. Proved Area (Acres)	Gravity of Oil (API)	PRODUCING FORMATION: Name	Kind	Age	Depth of Wells (Ft.): Minimum Top Pay	Depth of Wells (Ft.): Maximum Total Depth	Average Thickness Pay (Ft.)	Type Structure
ISTHMUS OF TEHUANTEPEC:									
Veracruz:									
Cuichapa	300	30	Concepción Inferior	Sand	Miocene	2100	2133	33	Faulted dome
El Burro	370	26	Concep. Inf.: Encanto	Sands	Miocene	2460	2620	62	Salt dome
El Plan, Lignitic Zone	830	24	Cedral, Lignitic	Sands	Miocene	1970	2440	216	Faulted Ant.
El Plan, Concepción	250	30	Concep. Inf.: Sup.	Sands	Miocene	5734	5865	131	Dome
El Plan, East Extension	80	35	Concep. Inf.: Encanto	Sands	Miocene	3883	4110	32	Faulted nose
Filisola	460	22	Encanto	Sand	Miocene	1585	1980	92	Fltd. terrace
Nuevo Teapa	40	36	Encanto	Sand	Miocene	429	711	29	Salt dome
Tonalá	470	28	Concep. Inf.: Encanto	Sands	Miocene	1640	2130	167	Salt dome
			Deposito	Sand	Oligocene				
NORTHEASTERN MEXICO:									
Tamaulipas:									
La Presa	....	Gas	Mt. Selman	Sand	Eocene	1925	3160	38	Anticline
Mier	....	Gas	Mt. Selman	Sand	Eocene	2120	2345	....	Nose
Misión	....	Dist.	Vicksburg	Sand	Lwr. Olig	....	6040	....	Anticline
Rancherias	1,230	Gas	Fayette / Yegua / Cook Mt.	Sand	Eocene	264	2440	310	Anticline
Reynosa	....	Dist.	Vicksburg	Sand	Lwr. Olig.	4625	8114	....	Anticline
TAMPICO AREA:									
Veracruz:									
Poza Rica	15,850	30	Tamabra	Lime	Lwr. Cre.	7250	7546	296	Nose
Soledad	....	40	Tamabra	Lime	Lwr. Cre.	6435	6480	10	Nose
Northern District, (Ebano, Pánuco, etc.)	100 000	12	Tamaulipas	Lime fracture	Lwr. Cre.	1148	1968	*	Faulted Ant.
Southern District, (Golden Lane)	33,000	20	El Abra	Line reef	Lwr. Cre.	2200	2202	†	Faulted Ant.

* Production from fractures in first 800 feet of Tamaulipas and San Felipe lines.

† Wells go into reef-phase limestone only about 2 feet.

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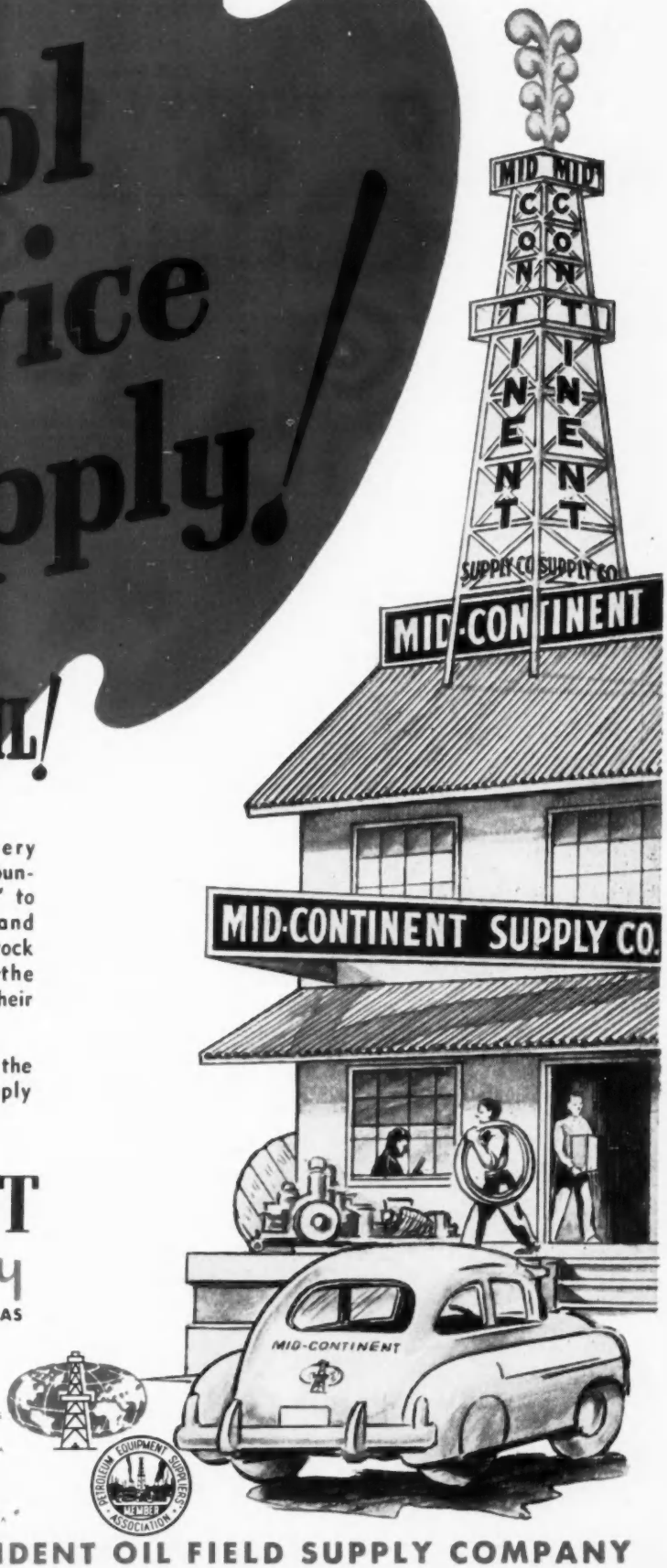

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CUSHING, OKLAHOMA
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NEW ORLEANS, LA.
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WICHITA, KANSAS

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THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

from Poza Rica field to Tuxpan.
50,000 barrel-per-day, 33-mile, two 8-inch crude lines from Tuxpan to Potrero.
25,000 barrels daily, 20-mile, 8-inch crude line from Cobos (Tuxpan) to Alamo field.
24,000 barrel-per-day, 103-mile, combination 8- and 10-inch crude line from Alamo field to Tampico.
63,000 barrels daily, 35-mile, 12-inch crude line from Poza Rica field to Alamo field.
75,000-barrel-a-day, 14-mile, 8- and 10-inch crude line from Alamo field to Potrero.
72,000 barrels daily, 87-mile, three 8-inch crude lines from Potrero to Chijol (Tampico).
35-mile, combination 8-, 10- and 12-inch (in series) crude line from

Oil Production in Mexico

DISTRICT	COMPANY	Year of Discovery	Shut In	Producing	Total	CRUDE OIL PRODUCTION (Barrels) Daily End of 1951	Year 1950	Year 1951	Cumulative Through 1951
Isthmus	Petroleos Mexicanos (Pemex)	1921	83	287	370	21,437	7,019,834	7,824,366	177,137,976
Northeastern	Petroleos Mexicanos	1948	12	30	42	2,152	624,034	785,478	2,143,918
Northern	Pemex, Mexican Gulf, Others	1901	158	575	733	23,395	8,795,444	8,539,109	829,289,421
Poza Rica	Petroleos Mexicanos	1930	35	114	149	143,910	46,716,165	52,527,048	464,593,598
Southern	Pemex, Mexican Gulf, Others	1908	69	264	333	20,312	8,962,121	7,413,958	1,110,012,071
Total		....	357	1,270	1,627	211,206	72,117,598	77,089,959	2,583,176,984

Drilling in Mexico

STATE and FIELD	WELLS COMPLETED IN 1951 Oil	Gas	Dry	TOTAL Wells	Footage	Drilling End of 1951	WELLS COMPLETED IN 1950 Oil	Gas	Dry	TOTAL Wells	Footage
ISTHMUS DISTRICT:											
Tabasco:											
Belem	..	..	..	..	.....	..	3	1	..	4	21,585
Huimanguillo	..	..	..	..	.....	..	..	..	3	3	16,402
José Colomo	2	..	..	2	11,300	2	..	..	..	..	.....
Lago del Carmen	..	..	..	..	.....	..	..	2	..	2	13,540
Sarlat	..	..	..	..	.....	..	..	..	1	1	8,235
Wildcats	1	..	5	6	30,048	1	..	..	..	..	.....
Vera Cruz:											
Acalapa	..	..	..	..	.....	..	..	..	2	2	5,096
Cuichapa	..	..	..	..	.....	..	1	..	..	1	2,287
El Plan	16	..	3	19	88,631	2	15	..	4	19	86,125
Moloacán	..	..	..	..	.....	..	1	..	1	2	5,027
Rabón Grande	4	..	2	6	19,678	2	..	..	..	..	.....
Tortuguero	..	..	..	..	.....	..	3	..	..	3	15,582
Wildcats	6	..	11	17	74,859	2	..	..	2	2	11,859
NORTHEASTERN DISTRICT:											
Chihuahua:											
Wildcats	..	..	..	..	.....	..	..	..	..	..	.....
Coahuila:											
Wildcats	..	..	1	1	6,570	..	..	..	..	..	.....
Nuevo Leon:											
Wildcats	..	..	1	1	9,843	..	..	..	..	..	.....
Tamaulipas:											
Brasil	..	1	1	2	15,581	1	..	4	1	5	37,106
Cano	2	2	1	5	35,184	1	5	..	1	6	39,332
Monterrey	1	..	..	1	6,562	1	3	1	..	4	29,060
Reynosa	..	2	..	2	14,047	3	..	4	..	4	25,864
Santo Domingo	..	..	..	..	.....	..	..	..	..	..	.....
Treviño	..	..	..	..	.....	..	..	..	..	..	.....
Wildcats	2	7	6	15	87,826	2	..	..	1	1	2,636
NORTHERN DISTRICT:											
San Luis Potosi:											
Limon	4	..	2	6	13,058	1	7	..	9	16	38,145
Wildcats	9	..	9	18	43,102	2	..	..	..	..	.....
Tamaulipas:											
Cacalilao	9	1	11	21	31,168	3	6	..	6	12	20,501
Chapacao	..	..	..	..	.....	..	2	..	9	11	22,716
Chijol	3	..	3	6	10,626	4	..	..	..	..	.....
Corcovado	..	..	..	..	.....	..	..	..	..	..	.....
Dicha Oriental	1	..	1	2	4,311	..	..	..	..	..	.....
Wildcats	..	..	4	4	13,782	..	..	..	..	..	.....
Veracruz:											
Barberena	3	..	1	4	5,837	..	..	..	..	..	.....
Panuco	..	..	..	..	.....	..	..	..	..	..	.....
Wildcats	..	..	5	5	9,667	3	..	..	..	..	.....
SOUTHERN DISTRICT:											
Puebla:											
Wildcats	..	..	..	..	.....	..	..	..	..	..	.....
Vera Cruz:											
Agua Nacida	..	..	..	..	.....	..	..	..	..	..	.....
Alazán	..	..	3	3	6,656	..	17	..	18	35	81,637
Cerro Azul	5	..	7	12	24,064	1	12	4	13	29	56,323
Cerro Viejo	3	..	..	3	5,733	1	..	..	1	1	1,991
Chinampa	..	..	..	..	.....	..	..	..	..	..	.....
Horcones	..	..	1	1	1,883	..	..	..	..	..	.....
Juan Felipe	8	..	5	13	27,146	2	..	..	..	..	.....
Miguel Alemán	..	..	..	..	.....	..	..	..	..	..	.....
Moralillo	1	..	..	1	5,304	..	7	..	5	12	57,985
Potrero	..	..	2	2	4,030	..	..	..	1	1	2,161
Poza Rica-Escolín	17	..	1	18	146,337	7	25	1	..	26	219,809
President Alemán	3	..	1	4	27,193	1	..	..	..	..	.....
San Diego	..	..	..	..	.....	..	..	..	..	..	.....
San Miguel Chico	1	..	..	1	2,669	..	..	..	1	1	2,518
San Miguel Mecatepec	5	..	..	5	38,812	3	2	..	1	3	23,763
Tancoco	..	..	..	..	.....	..	..	..	1	1	6,996
Tenexco	..	..	..	..	.....	..	1	..	1	2	10,380
Toteco	..	..	..	..	.....	..	..	..	4	4	8,612
Wildcats	16	..	45	61	230,595	3	..	..	2	2	16,330
NORTHWESTERN DISTRICT:											
Baja California:											
Wildcats	..	..	1	1	9,848	..	..	..	..	..	.....
Totals	122	13	133	268	1,061,950	48	110	17	90	217	904,023

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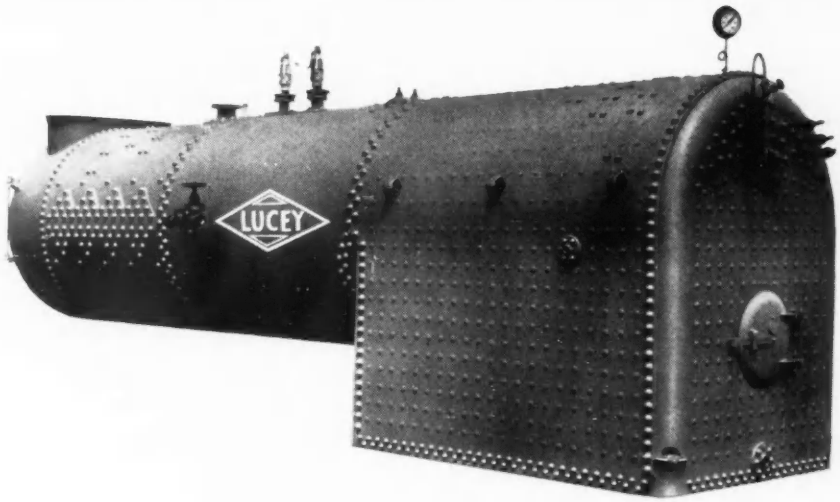

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from Poza Rica field to Tuxpan.
50,000 barrel-per-day, 33-mile, two 8-inch crude lines from Tuxpan to Potrero.
25,000 barrels daily, 20-mile, 8-inch crude line from Cobos (Tuxpan) to Alamo field.
24,000 barrel-per-day, 103-mile, combination 8- and 10-inch crude line from Alamo field to Tampico.
63,000 barrels daily, 35-mile, 12-inch crude line from Poza Rica field to Alamo field.
75,000-barrel-a-day, 14-mile, 8- and 10-inch crude line from Alamo field to Potrero
72,000 barrels daily, 87-mile, three 8-inch crude lines from Potrero to Chijol (Tampico).
35-mile, combination 8-, 10- and 12-inch (in series) crude line from

Oil Production in Mexico

DISTRICT	COMPANY	Year of Discovery	Shut In	Producing	Total	CRUDE OIL PRODUCTION (Barrels) Daily End of 1951	Year 1950	Year 1951	Cumulative Through 1951
Isthmus	Petroleos Mexicanos (Pemex)	1921	83	287	370	21,437	7,019,834	7,824,366	177,137,976
Northeastern	Petroleos Mexicanos	1948	12	30	42	2,152	624,034	785,478	2,143,918
Northern	Pemex, Mexican Gulf, Others	1901	158	575	733	23,395	8,795,444	8,539,109	829,289,421
Poza Rica	Petroleos Mexicanos	1930	35	114	149	143,910	46,716,165	52,527,048	464,593,598
Southern	Pemex, Mexican Gulf, Others	1908	69	264	333	20,312	8,962,121	7,413,958	1,110,012,071
Total		....	357	1,270	1,627	211,206	72,117,598	77,089,959	2,583,176,984

Drilling in Mexico

STATE and FIELD	WELLS COMPLETED IN 1951 Oil	Gas	Dry	TOTAL Wells	Footage	Drilling End of 1951	WELLS COMPLETED IN 1950 Oil	Gas	Dry	TOTAL Wells	Footage
ISTHMUS DISTRICT:											
Tabasco:											
Belem	..	..	..	..	.....	..	3	1	..	4	21,585
Huimanguillo	..	..	..	..	.....	..	..	..	3	3	16,402
José Colomo	2	..	..	2	11,300	2	..	..	..	..	.....
Lago del Carmen	..	..	..	..	.....	..	..	2	..	2	13,540
Sarlat	..	..	..	..	.....	..	..	..	1	1	8,235
Wildcats	1	..	5	6	30,048	1	..	..	..	..	.....
Vera Cruz:											
Acalapa	..	..	..	..	.....	..	..	..	2	2	5,096
Cuichapa	..	..	..	..	.....	..	1	..	..	1	2,287
El Plan	16	..	3	19	88,631	2	15	..	4	19	86,125
Moloacán	..	..	..	..	.....	..	1	..	1	2	5,027
Rabón Grande	4	..	2	6	19,678	2	..	..	..	..	.....
Tortuguero	..	..	..	..	.....	..	3	..	..	3	15,582
Wildcats	6	..	11	17	74,859	2	..	..	2	2	11,859
NORTHEASTERN DISTRICT:											
Chihuahua:											
Wildcats	..	..	..	..	.....	..	..	..	..	..	.....
Coahuila:											
Wildcats	..	..	1	1	6,570	..	..	..	..	..	.....
Nuevo Leon:											
Wildcats	..	..	1	1	9,843	..	..	..	..	..	.....
Tamaulipas:											
Brasil	..	1	1	2	15,581	1	..	4	1	5	37,106
Cano	2	2	1	5	35,184	1	5	..	1	6	39,332
Monterrey	1	..	..	1	6,562	1	3	1	..	4	29,060
Reynosa	..	2	..	2	14,047	3	..	4	..	4	25,864
Santo Domingo	..	..	..	..	.....	..	..	..	..	..	.....
Treviño	..	..	..	..	.....	..	..	..	..	..	.....
Wildcats	2	7	6	15	87,826	2	..	..	1	1	2,636
NORTHERN DISTRICT:											
San Luis Potosi:											
Limon	4	..	2	6	13,058	1	7	..	9	16	38,145
Wildcats	9	..	9	18	43,102	2	..	..	..	..	.....
Tamaulipas:											
Cacalilao	9	1	11	21	31,168	3	6	..	6	12	20,501
Chapacao	..	..	..	..	.....	..	2	..	9	11	22,716
Chijol	3	..	3	6	10,626	4	..	..	..	..	.....
Corcovado	..	..	..	..	.....	..	..	..	..	..	.....
Dicha Oriental	1	..	1	2	4,311	..	..	..	..	..	.....
Wildcats	..	..	4	4	13,782	..	..	..	..	..	.....
Veracruz:											
Barberena	3	..	1	4	5,837	..	..	..	..	..	.....
Panuco	..	..	..	..	.....	..	..	..	..	..	.....
Wildcats	..	..	5	5	9,667	3	..	..	..	..	.....
SOUTHERN DISTRICT:											
Puebla:											
Wildcats	..	..	..	..	.....	..	..	..	..	..	.....
Vera Cruz:											
Agua Nacida	..	..	..	..	.....	..	..	..	..	..	.....
Alazán	..	..	3	3	6,656	..	17	..	18	35	81,637
Cerro Azul	5	..	7	12	24,064	1	12	4	13	29	56,323
Cerro Viejo	3	..	..	3	5,733	1	..	..	1	1	1,991
Chinampa	..	..	..	..	.....	..	..	..	..	..	.....
Horcones	..	..	1	1	1,883	..	..	..	..	..	.....
Juan Felipe	8	..	5	13	27,146	2	..	..	..	..	.....
Miguel Alemán	..	..	..	..	.....	..	..	..	..	..	.....
Moralillo	1	..	..	1	5,304	..	7	..	5	12	57,985
Potrero	..	..	2	2	4,030	..	..	..	1	1	2,161
Poza Rica-Escolín	17	..	1	18	146,337	7	25	1	..	26	219,809
President Alemán	3	..	1	4	27,193	1	..	..	..	..	.....
San Diego	..	..	..	..	.....	..	..	..	..	..	.....
San Miguel Chico	1	..	..	1	2,669	..	..	..	1	1	2,518
San Miguel Mecatepec	5	..	..	5	38,812	3	2	..	1	3	23,763
Tancoco	..	..	..	..	.....	..	..	..	1	1	6,996
Tenexco	..	..	..	..	.....	..	1	..	1	2	10,380
Toteco	..	..	..	..	.....	..	..	..	4	4	8,612
Wildcats	16	..	45	61	230,595	3	..	..	2	2	16,330
NORTHWESTERN DISTRICT:											
Baja California:											
Wildcats	..	..	1	1	9,848	..	..	..	..	..	.....
Totals	122	13	133	268	1,061,950	48	110	17	90	217	904,023

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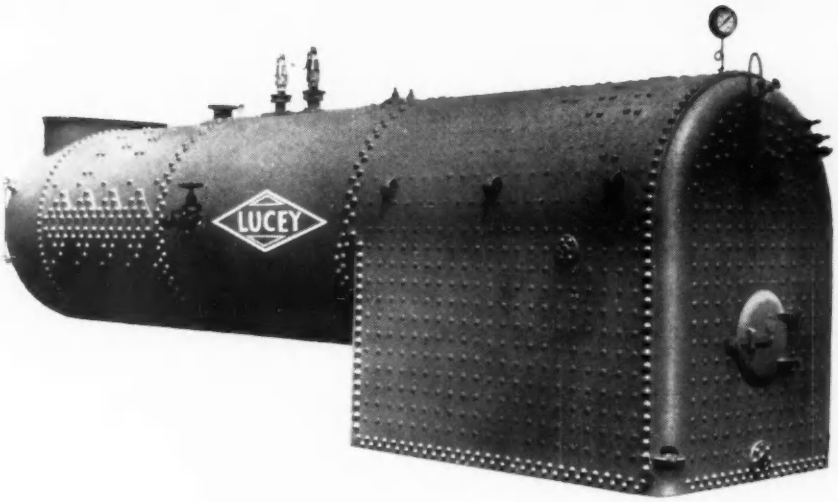

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Tonala field to Minatitlan Refinery.
21-mile, combination 8-, 10- and 12-inch (in series) crude line from El Plan field to El Chapo station.
30,000 barrels daily, 6-mile, 10-inch crude line from El Chapo station to Nachita.
Three-mile, 8-inch crude line from Chichapa to El Plan-El Chapo.
118-mile, 2-inch crude line from El Plan field to Jose Colomo field.
15,000 to 30,000 barrels daily, 155-mile, 8-inch products line from Minatitlan to Salina Cruz.
23-mile, 2-inch products line from Tonala field to Nanchital.
76-mile, 8-inch products line from Salamanca to Lagos, Jalisco, projected.
122-mile, 6-inch products line from Lagos to Guadalajara, projected.
53-mile, 6-inch products line from Lagos to Aguascalientos, projected.
71-mile, 4-inch products line from Salamanca to Morelia, projected.
30 million cubic feet daily, 150-mile, 20-inch gas line from Poza Rica field to Mexico City.
25-mile gas line from Monterrey Cementos Hidalgos.
212-mile, 16-inch gas line from Monterrey to Torreon, building 1952.
415-mile, 20-inch gas line from Brasil to Tampico and Tampico to Poza Rica, building 1952.

Compania Mexicana de Gas de Monterrey: 50 Mmcf. daily, 96-mile, 12-inch gas line from Roma to Monterrey.
30 Mmcf. daily, 37-mile, 12-inch gas line from Mision field to Roma.

Gas Industrial de Monterrey, S. A.: 50 Mmcf. daily, 135-mile line, 14-inch gas line from Reynosa field to Monterrey.

REFINERIES OF MEXICO

Petroleos Mexicanos: 19,000 barrels daily, atmospheric distillation down to asphalt refinery at Ciudad Madero, Tampico.
62,000-barrel-per-day, topping followed by secondary steam distillation refinery at Ciudad Madero.
13,000 barrels daily, topping plant at Villa Cuahtemoc, Vera Cruz.
3500 barrels daily, topping refinery at Poza Rica.
21,000-barrel-per-day, topping followed by vacuum distillation refinery at Minatitlan, Puerto Mexico.
48,000 barrels daily, topping refinery at Atzcapotzalco (Mexico City).
27,000-barrel-per-day topping refinery at Salamanca.
3600 barrels daily topping refinery at Reynosa, Tamaulipas.
660 barrels daily, isomerization refinery at Atzcapotzalco (Mexico City).
1500-barrel-per-day alkylation refinery at Atzcapotzalco (Mexico City).
4200 barrels daily, light ends fractionation refinery at Atzcapotzalco (Mexico City).
10,000-barrel-per-day, gasoline desulfurization refinery at Atzcapotzalco (Mexico City)
10,000 barrels daily, gasoline desulfurization refinery at Ciudad Madero.
6000-barrel-per-day, wax plant at Ciudad Madero.
4000 Mcf. daily absorption plant at Ciudad Madero.
400 barrels daily, wax plant, Arbol Grande, at Ciudad Madero.
1500 barrels daily, lube rerun plant, Arbol Grande, at Ciudad Madero.
5500-barrel-per-day, high vacuum refinery at Minatitlan.
800-barrels-per-day, lube rerun plant at Minatitlan.
2000 barrels daily kerosine, 600 barrels daily lube, Edeleanu refinery at Minatitlan.
10,000-barrel-per-day gasoline desulfurization plant at Salamanca, Guanajuato.
80,000 barrels daily crude stabilization refinery at Poza Rica, Vera Cruz.
120,000 Mcf. daily gas absorption plant at Poza Rica, Vera Cruz.
100,000 Mcf. daily, gas purification with amines plant at Poza Rica, Vera Cruz.
120 tons daily, sulfur plant at Poza Rica, Vera Cruz.

Gas Production in Northeastern Mexico

STATE and FIELD	Operating Company	Producing Wells End of 1951	GAS PRODUCTION (Millions of Cubic Feet) Year 1950	Year 1951	Cumulative Through 1951
TAMAULIPAS:					
Brasil	Petroleos Mexicanos	3	78.6	1,000.0	1,121.5
Camargo and Valadeces	Petroleos Mexicanos	1	446.2	300.0	1,571.1
Cano	Petroleos Mexicanos	3	44.0	50.0	103.8
Mision	Petroleos Mexicanos	1	1,792.5	1,200.0	10,937.3
Monterrey	Petroleos Mexicanos	1	47.4	100.0	147.4
Reynosa	Petroleos Mexicanos	16	2,433.7	7,933.9	11,297.9
Trevino	Petroleos Mexicanos	2	.....	30.0	30.0
Total Petroleos Mexicanos		27	4,842.4	10,613.9	25,209.0
La Presa	Ohio Mex.	1	140.9	120.0	2,306.5
Rancherias	Ohio Mex.	5	47.0	13.0	15,694.9
Mier and Lajitas	Munoz y Martinez	6	703.8	547.7	20,585.3
Total Northeastern Mexico		39	5,734.1	11,294.6	63,795.7

UNITED STATES

Nation's Greatest Number of Wells Drilled During 1951; Production Gains and Refining Capacity Still Expanding

GROWTH, expansion, and increases were the rule in U. S. oil and gas operations during 1951, as the industry went about its work of supplying the nation's greatest petroleum needs. In practically every phase of the industry, operations were at new all-time highs, and further increases were the trend as the year closed.

The greatest number of wells ever drilled in a single year were completed in 1951 and they were drilled to considerably greater depths on the average than ever before. The active drilling program proved vast amounts of new oil and gas reserves, and even though production of those were at all-time high levels, end of year reserves stood at the highest levels in history.

At the end of the year, the number of producing oil wells in the U. S. stood at a new high, and these plus the vast number to be drilled during 1952, promise to make the new year the greatest producing period in the industry's history.

The refining branch of the industry continued to build additional processing capacity during the year and operated its facilities at record-breaking rates to produce peak amounts of petroleum products. The nation's output of natural gasoline and sales of liquefied petroleum gases were also at all-time peaks in 1951.

A total of 44,826 new wells was drilled in 1951, for a new record for a single year's operations. That record compared with the previous peak of 43,307 wells completed in 1950 represented a gain of 1519 wells or 3.5 percent. Footage drilled rose more sharply, totaling 174,261,718 feet as compared with 159,761,732 feet in the previous year. That gain amounted to 9.1 percent, or considerably greater than the increase in number of wells. The increase in footage boosted the average depth to a new all-time high of 3888 feet per well, in comparison with the previous peak of 3689 feet in 1950.

Production of crude in the U. S. during 1951 was substantially greater than ever before. Crude output took one of the sharpest gains in history, the daily average yield of 6,149,100 barrels being 13.8 percent and nearly ¾ million barrels above 1950's production and substantially greater than the former peak of 5,519,000 daily in 1948.

Natural gasoline production was stepped up to 563,000 barrels daily during the year, for a new high mark that topped the previous record reached in 1950 by 13.2 percent. Marketed production of natural gas also hit a new peak of 7252 billion cubic feet, which was 15.4 percent higher than the all-time high mark reached in 1950.

The year saw the discovery of an estimated 3,819,591,000 barrels of crude and natural gas liquid reserves, which was ½ million more than the previous year's additions. With production rising to 2,469,405,000 barrels of crude and natural gas liquids in 1951, the discovery of this large quantity resulted in net additions of only 1,350,-

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186,000 barrels to underground reserves. At the year's end, estimated crude reserves stood at 26,308,610,000 barrels, a net change of 1,040,212,000 barrels during the year.

Refining operations included the running of 2,371,-168,000 barrels of crude—6,496,300 daily—into plant stills, and that was good for a new record. The previous peak had been 2,094,867,000 barrels—5,739,400 daily—processed in 1950. The rated capacity of all U. S. refineries totaled 7,229,000 barrels daily at the end of 1951, and at that time the plants were being operated at 91.7 percent of rated capacity. A comparison with a year earlier showed that refining capacity had been hiked 505,000 barrels a day during 1951 to the new all-time high.

Construction of crude and product pipe lines as well as natural gas lines declined in 1951 because of steel shortages. A total of 12,628 miles of pipe line was placed in operation during the year, compared with 16,120 miles completed a year earlier.

Detailed data on U. S. operations are not presented in this issue of WORLD OIL, as they were covered in the Review-Forecast Issue of February 15, 1952. A partial list of the data contained in the Review-Forecast Issue is presented in the table below:

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CENTRAL AMERICA

Activity Slight During Year Though Deposits of Oil Are Strongly Indicated in Four Sedimentary Basins

WITH limited exception, Central America had no exploration developments in 1951. This was despite indicated presence of oil in commercial quantities in four of eight sedimentary basins extending into parts of Guatemala, British Honduras, Nicaragua, Costa Rica, and Panama. Save in Guatemala, favorable terms for the search for oil are available to private capital companies, both foreign and domestic.

Union Oil Company of California received approval from the Costa Rican Congress in 1951 for an exclusive exploration concession covering more than three million acres in Limon and Guanacaste provinces. Limon concession extends along the Caribbean coast; Guanacaste is situated on the northern Pacific Coast. Union has had two seismograph crews operating there.

No petroleum activity has been carried on in Guatemala since withdrawal of The Atlantic Refining Company, The Ohio Oil Company, and Standard Oil Company of Ohio early in 1950 after passage of a 1949 decree restricting oil operations. Production of mineral resources in Guatemala now is open only to the government, Guatemalans, and companies in which the capital is owned at least 60 percent by Guatemalans.

Public statements by top government officials indicated some revisions of the decree may be made to encourage foreign participation in creating an oil industry, but governmental attitudes in dealing with foreign-owned entities during 1951 and 1952 offered no encouragement. The nation is now dependent on imports from Venezuela.

Government officials said only minor changes were needed to correct the stalemate. Oil company observers said major changes were required to establish a political and economic climate favorable for private capital.

Such major changes would include abolishing that section of the 1949 decree which establishes the oil industry as a public utility. Such a classification means the industry would be subject to passage of retroactive legislation at any time, under the Guatemalan constitution.

Under geological belief that Barbados oil potential is excellent, Barbados Gulf Oil Company spudded in its first exploratory well in 1952 on its concession of half the island's 166.3 square miles. The license, granted in 1951, covers exploration rights for four years in six parishes and territorial waters contiguous to part of the leeward coast.

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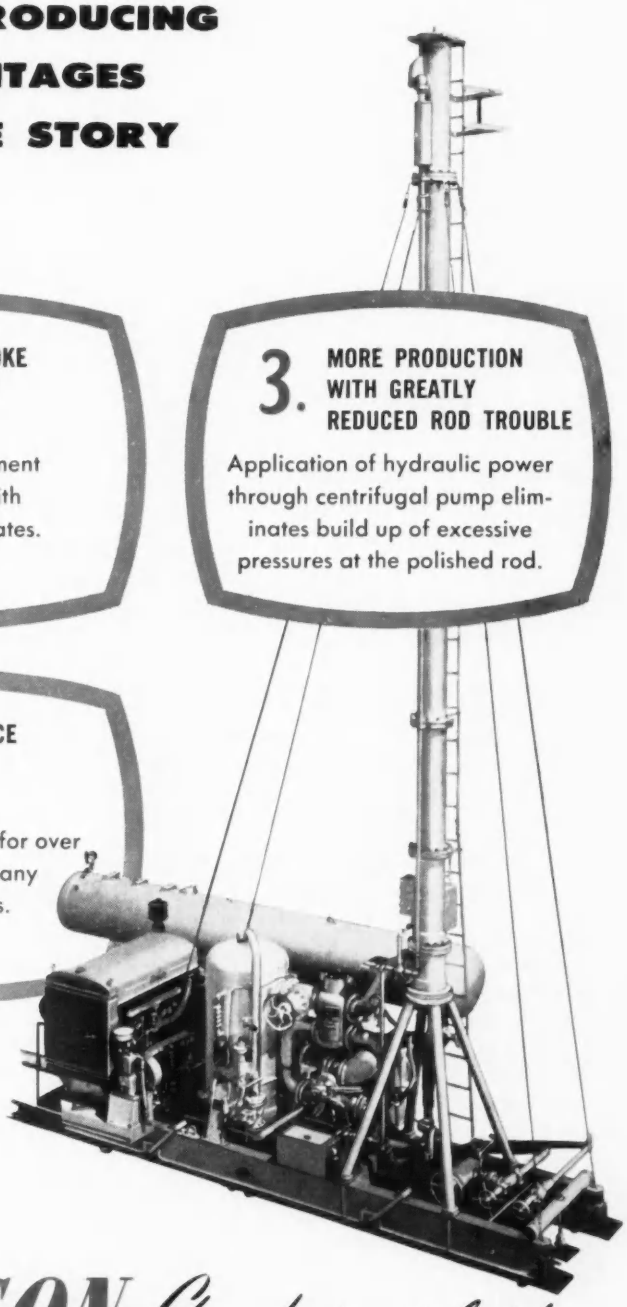

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CUBA

ATTEMPTS to find new oil in Cuba failed again in 1951. The first traceable production dates back to 1933. Total production in 1951 from the two small fields was 118,000 barrels.

Montembo, the oldest field, was discovered before the turn of the century. Since then, only one deposit of new oil has been found—the Jarahueca field in 1943. The most important exploratory campaign on the island has been conducted by Cuban Gulf Oil Company, a Gulf Oil Corporation subsidiary, which began a third deep test at the close of the year. Early in 1951, the company abandoned its second deep test at 11,218 feet without a satisfactory show of oil.

The National Development Commission announced in May that $500,000 would be made available for equipment necessary to drill wells to 10,000 feet. The equipment was to be rented.

The Cuban-Venezuelan Oil Voting Trust announced that a geophysical survey of likely areas in a 16-million acre concession on Cuba's south coast was scheduled. South Coast surveys have lately indicated extensive sedimentary formations.

TRINIDAD

Completions Decline But Total Footage Increases and Production Shows Gain of 232,965 Barrels During 1951

TRINIDAD'S 2151 oil wells produced during 1951 20,532,369 barrels, up 232,965 from 1950. Although Trinidad completions slipped to 142, two less than in each of the two preceding years, total footage drilled in 1951 rose 33,919 feet to 637,938. Twenty-three wells were drilling at the close of the year.

Of the wells drilled, 129 found oil, 1 was a gas well, and 12 were failures.

Forest Reserve field led in drilling with 27 wells and total footage of 124,009 feet. All were oil producers and all were drilled by Trinidad Leaseholds, Ltd. Next was Brighton-Vessigny field with 17 wells and a footage of 56,276 feet. These wells were drilled by Antilles Petroleum Company (Trinidad) Ltd.

Trinidad Leaseholds drilled 45 wells in ten fields. The company continued exploratory drilling at the same rate as in 1950. Its single wildcat, Morne Diablo 34, is the deepest well on the island, with a depth of 14,018 feet. This well penetrated a hitherto unknown section of Upper Cretaceous sandstones which yielded salt water on production test. Another well was being drilled for Cretaceous objectives.

Antilles Petroleum completed in July its first marine well, A. S. 1, directionally drilled from the shore. It found oil.

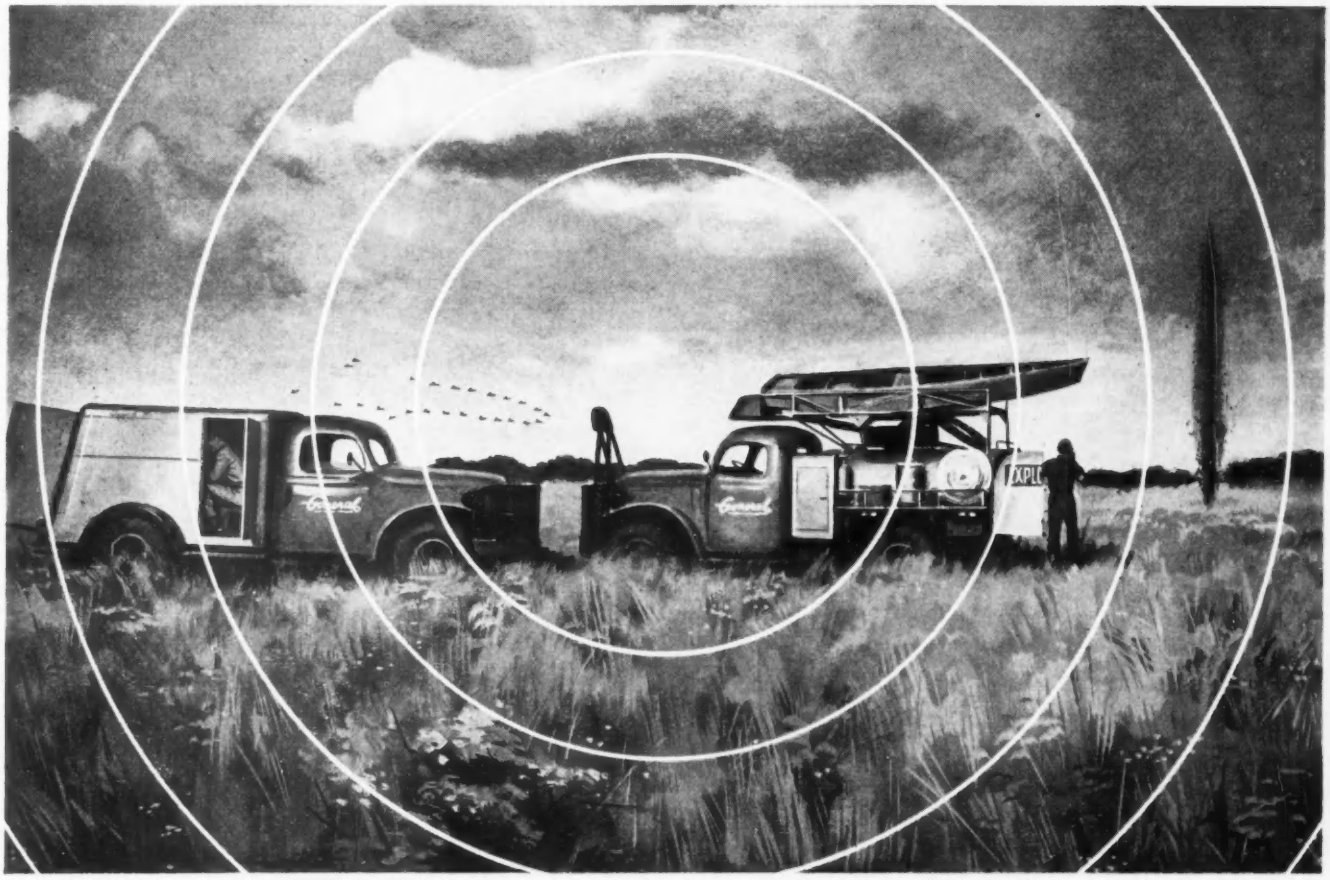
Kern Trinidad Oilfields, Ltd., completed nine oil wells and drilled a dry hole at Guapo. This field produced 707,196 barrels of oil in 1951, up 157,845 over 1950. At the close of the year, Kern Trinidad was producing 2300 barrels daily from 39 flowing wells and 93 pumpers.

Trinidad Petroleum Development Company, Ltd., completed in April a deep test in the Coora field. Drilled to 13,471 feet, the well was producing from Oligocene (Herrera) sand at 8500 feet. The field produced 996,012 barrels of oil in 1951, up 40,177 over the previous year. This output was reached by 107 wells, of which 37 were flowing.

Geologists think prospects are good that Herrera sand

Oil Production in Trinidad

FIELD	Operating Company	Year of Discovery	PRODUCING OIL WELLS END OF 1951			CRUDE OIL PRODUCTION (Barrels)			
			Flowing	Art. Lift	Total	Daily End of 1951	Year 1950	Year 1951	Cumulative Through 1951
Barrackpore	Trinidad Leaseholds, Ltd.	1918	14	36	50	1,183	486,086	451,880	8,440,120
Brighton-Vessigny	Antilles Petroleum Co. (Trinidad), Ltd.	1909	46	54	100	1,700	578,936	602,851	8,686,690
Coora	Trinidad Pet. Development Co., Ltd.	1936	37	70	107	2,880	955,835	996,012	19,163,332
Cruse	Trinidad Leaseholds, Ltd.	1913	18	90	108	1,830	769,325	675,126	17,179,435
Erin	Trinidad Pet. Development Co., Ltd.	1948	1	....	1	20	20,175	9,153	38,676
Forest Reserve	Trinidad Leasehold, Ltd.	1914	102	333	435	14,026	5,208,539	5,168,850	106,401,191
Fyzabad	Apex (Trinidad) Oilfields, Ltd.	1920	28	223	251	5,200	1,925,100	1,977,600	80,910,300
Guapo	Kern Trinidad Oilfields, Ltd.	1921	39	93	132	2,300	549,351	707,196	15,505,227
Guayaguayare & Maloney	Trinidad Leaseholds, Ltd.	1902	7	62	69	1,157	359,915	380,396	9,661,612
Los Bajos	Trinidad Pet. Development Co., Ltd.	1937	....	13	13	100	86,487	41,953	3,335,268
Mackenzie	Trinidad Pet. Development Co., Ltd.	1949	2	1	3	100	42,458	28,545	98,712
Mandingo	Trinidad Pet. Development Co., Ltd.	1948	1	....	1	10	3,134	3,029	17,099
Morne Diablo	Trinidad Leaseholds, Ltd.	1936	3	19	22	351	114,810	117,414	2,576,454
New Dome	United British Oilfields of Trinidad, Ltd.	n.a.	....	9	9	70	31,501	27,473	2,369,534
Palo Seco	Trinidad Leaseholds, Ltd.; Trinidad Pet. Development Co.	1926	49	131	180	3,494	1,030,425	1,274,858	25,446,570
Penal	United British Oilfields of Trinidad, Ltd.	1935	28	90	118	6,373	2,283,639	2,358,748	20,194,178
Point Fortin*	United British Oilfields of Trinidad, Ltd.	1908	80	265	345	7,597	3,076,369	2,912,630	65,848,540
Quarry	Apex (Trinidad) Oilfields, Ltd.; Trinidad Pet. Dev. Co., Ltd.	1938	49	73	122	4,680	1,645,248	1,629,158	20,012,745
Quinan	Trinidad Leaseholds, Ltd.	1936	3	12	15	295	102,374	95,833	1,501,216
San Francique	United British Oilfields of Trinidad, Ltd.	1922	....	20	20	217	88,237	83,221	4,899,877
Siparia Syncline	Apex (Trinidad) Oilfields, Ltd.	1945	8	....	8	1,400	534,000	576,700	2,074,000
Sunty	Trinidad Leaseholds, Ltd.	1951	1	....	1	14	.....	4,314	4,314
Wilson	Trinidad Leaseholds, Ltd.	1918	3	38	41	1,183	407,460	409,429	4,411,579
Abandoned Fields		....	....	....	....	....	.....	.....	.....
Total		....	519	1,632	2,151	56,180	20,299,404	20,532,369	418,776,669



WE SET OUR SIGHTS ON TODAY...*six years ago*

Despite the many improvements which have been developed since the seismograph technique was introduced, field experience proved to us as early as 1943 that widely scattered crews were too dependent on the "headquarters" laboratory for routine equipment maintenance. Too often, valuable time was lost when minor repairs and adjustments made instrument exchange necessary. Too often, crews encountered climatic and field conditions that materially affected the performance of their equipment. Too often, crews had to spend weeks compiling data that we are now able to obtain in a matter of days.

In 1946, General Geophysical established a planned program to develop equipment that would be completely climate-proof . . . equipment that could be repaired in the field . . . equipment to meet specific needs of widely varying areas . . . equipment to enable crews to obtain more production in a normal day's work.

Today, the results of our planned program are paying dividends to General clients in the form of more accurate seismograph data, more quickly compiled and at lower costs for completed surveys under any field conditions we encounter.

When your contract is with General, you get the dependability and accuracy of General's exclusive climate-proofed and unitized plug-in construction equipment . . . plus the skills of capable crews who are qualified by training and experience to help you explore new areas.

This is the first in a new series of advertisements which will detail the results of General's planned program of equipment improvement.

General GEOPHYSICAL COMPANY

GULF BLDG. HOUSTON

extends over a considerable part of the company's holdings in Coora field and possibly in the Palo Seco field, too.

The seven fields in which Trinidad Petroleum operates yielded 2,984,479 barrels in 1951, up 100,544 barrels from the previous year.

Trinidad Petroleum completed a wildcat in 1951 at Marabella, two miles northeast of San Fernando. It found production in Oligocene (Herrera) sand at 6478 feet.

Premier Consolidated Oilfields, Ltd., drilled successful oil wells at San Francique and Barrackpore. Premier's nine flowing wells and 172 pumpers yielded 379,457 barrels of oil in 1951, down 17,647 barrels from 1950.

Apex (Trinidad) Oilfields, Ltd., completed 14 wells in its three operating fields of Fyzabad, Siparia Syncline and Quarry for total footage of 81,615 feet. Four wells were drilling at the close of the year.

The company purchased a heavy diesel rig capable of drilling to 15,000 feet, and will carry out deeper drilling in the Siparia Syncline field in 1952. Objective: the Herrera sands.

Over-all production for 1952 is expected to approximate 1951 production from 59 flowing and 242 pumping wells in three fields. That output reached a total of 3,108,200 barrels, up 214,400 barrels from the previous year. Average daily production at the end of 1951 for Fyzabad, Siparia Syncline and Quarry fields was 8400 barrels.

TRINIDAD PIPE LINES

Trinidad Leaseholds, Ltd.: 16.29-mile, 10-inch crude line from Forest Reserve to Pointe-a-Pierre.
16.29-mile, 8-inch crude line from Forest Reserve to Pointe-a-Pierre.
27½-mile, 6-inch crude line from Guayaguayare to Philippine.
4.36-mile, 4-inch crude line from Palo Seco to Forest Reserve.
5.70-mile, 4-inch crude line from Morne Diablo to San Francique.
5½-mile, 6-inch crude line from Cruse to Forest Reserve.
16.04-mile, 12-inch natural gas line from Forest Reserve to Pointe-a-Pierre.
5.79-mile, 6-inch H. P. gas line from Penal to Philippine.
4.72-inch, 6-inch H. P. gas line from Penal to San Francique.

Antilles Petroleum Company (Trinidad), Ltd.: 2.3-mile, 4-inch crude line from Brighton to Jetty.
3.6-mile, 6-inch products line from Brighton to Interfield.

Kern Trinidad Oilfields, Ltd.: 6-mile, 6-inch crude line (idle).
4-mile, 6-inch natural gas line (in use).

Trinidad Petroleum Development Company, Ltd.: 8.9-mile, one 6-inch and one 4-inch crude line from Los Bajos to Point Fortin.
11-mile, 5-inch crude line from Palo Seco to Sobo La Brea.
5-mile, 4-inch crude line from Palo Seco to Erin.
3-mile, 6-inch crude line from Palo Seco to Los Bajos.
3-mile, 4-inch crude line from Barrackpore to Penal.
6-mile, two 4-inch crude lines froom Coora to Los Bajos.
6-mile, 8-inch gas line from Coora to Los Bajos.
6-mile, 6-inch gas line from Coora to Los Bajos.

United British Oilfields of Trinidad, Ltd.: 10,000-15,000 barrels daily, 17.5 mile, 8-inch crude line from Penal to Point Fortin.
7.5-mile, 6-inch line from Quarry to Point Fortin.
8-mile, one 6-inch line from Los Bajos to Point Fortin.
One 4-inch line from Los Bajos to Point Fortin.
5-mile, two 4-inch lines from Morne Diablo to Los Bajos.
23-mile, 6-inch line from Brighton and Guapo to Quarry.
12,000-24,000-barrel-a-day system composed of a 2.7-mile, 8-inch and a 3.2-mile, 6-inch line from Point Fortin field to Point Fortin refinery.

Apex (Trinidad) Oilfields, Ltd.: 750-barrel-per-day, 12-mile, 2-inch products line from Fyzabad to Point Fortin.

TRINIDAD REFINERIES

The United British Oilfields of Trinidad, Ltd.: 30,000-barrel-per-day skimming asphalt refinery at Point Fortin, 35½ miles from Port-of-Spain.

Apex (Trinidad) Oilfields, Ltd.: 10,000-barrel-a-day gasoline recovery plant.

Trinidad Petroleum Development Company, Ltd.: 1300 barrels daily, skimming Plant at Brighton.

Trinidad Leaseholds, Ltd.: 75,000 barrels daily, complete except lube, refinery at Pointe-a-Pierre, three miles south of San Fernando.

Brighton Terminal, Ltd.: 5000 barrels daily skimming plant at La Brea.

Trinidad Lake Asphalt Company, Ltd.: 2000 barrels daily, asphalt from pitch lake refinery at Brighton.

Drilling in Trinidad

FIELD	WELLS COMPLETED IN 1951 Oil	Gas	Dry	TOTAL Wells	Footage	Wells Drilling End of 1951	WELLS COMPLETED IN 1950 Oil	Gas	Dry	TOTAL Wells	Footage
Barrackpore	2		1	3	13,732	1	2		1	3	13,335
Brighton-Vessigny	17			17	56,276	2	14	2		16	60,571
Coora	1			1	13,471	2	3			3	13,813
Cruse	1			1	6,221	1	1			1	2,416
Erin											
Forest Reserve	27			27	124,009	2	28		2	30	117,183
Fyzabad	6		1	7	26,873	1	8		1	9	47,299
Guapo	9		1	10	40,489	1	10		1	11	45,402
Guayaguayare & Maloney	4			4	6,977						
Mackenzie	1			1	7,500		1			1	7,117
Morne Diablo			1	1	1,414						
Marac						1					
Palo Seco	16		1	17	76,728	2	11			11	63,428
Penal	13		1	14	60,969	4	12		1	13	49,305
Point Fortin	16		1	17	76,447	3	14		3	17	65,428
Quarry	9			9	50,417	2	16	1	3	20	68,671
Quinam	2			2	6,012		2			2	3,102
San Francique	1			1	1,200						
Siparia Syncline	3	1	1	5	42,447		1		2	3	16,955
Sunty	1			1	4,430						
Wilson						1					
Wildcats			4	4	22,326		2		2	4	29,994
Total	129	1	12	142	637,938	23	125	3	16	144	604,019

Engineering and Geological Data on Trinidad

FIELD	Proved Area (Acres)	Gravity of Oil (API)	PRODUCING FORMATION Name	Kind	Age	DEPTH (Ft.) Min. to Top of Pay	Max. to Bottom of Pay	Average Thickness of Pay	Type of Structure
Barrackpore	500	17–31	Wilson	Sand	Miocene	500	3500	100	Faulted Anticline
			Herrera	Sand	Oligocene	3000	6000	250	Faulted Anticline
Brighton-Vessigny	1300	30	Morne L'Enfer, Forest	Sand	Miocene	700	2200	50–70	Faulted Anticline
			Nariva	Sand	Oligocene	1800	4600	200	Faulted Anticline
Coora	850	19–30	Morne L'Enfer, Forest	Sand	Miocene	500	6500	20–1200	Faulted Monocline
Cruse	250	13–30	Cruse	Sand	Miocene	1800	4000	200	Stratographic Trap
Erin	10	29	Cruse	Sand	Miocene	3100	3200	50	Faulted Monocline
Forest Reserve	3000	15–33	Forest	Sand	Miocene	0	3500	150	Anticline
			Cruse	Sand	Miocene	1500	8000	200	Anticline
Fyzabad	1600	16–34	Forest, Cruse	Sand	Miocene	127	7200	50–460	Anticline
Guapo	960	14–24	Cruse	Sand	Miocene	250	2500	1800	Anticline
Guayaguayare & Maloney	100	15–50	Forest, Cruse	Sand	Miocene	0	5000	150	Faulted Trap
Los Bajos	200	27–37	Morne L'Enfer, Forest	Sand	Miocene	3000	6000	20–1000	Faulted Monocline
Mackenzie	60	29	Morne L'Enfer	Sand	Miocene	6200	6650	100	Syncline
Mandingo	10	44	Herrera	Sand	Oligocene	3100	3600	130	Anticlinal Crest
Morne Diablo	50	20–33	Cruse	Sand	Miocene	1000	4700	100	Faulted Trap
Palo Seco	700	18–33	Forest, Cruse	Sand	Miocene	1000	6400	20–400	Syncline
Penal	800	21	Forest, Cruse, Wilson	Sand	Oligocene	1300	2500	.....	Faulted Anticline
Point Fortin	1300	17–26	Forest, Cruse	Sand	Miocene	1600	8900	.....	Faulted Anticline
Quarry	500	15–49	Forest, Cruse	Sand	Miocene	280	6800	20–1200	Faulted Trap
Quinam	40	26–34	Cruse	Sand	Miocene	1000	4300	100	Faulted Trap
San Francique	100	21	Forest, Cruse	Sand	Miocene	.....	.....	.....	.....
Siparia Syncline	410	19–45	Cruse	Sand	Miocene	7200	7950	40	Faulted Trap
Sunty	.....	.....	.....	Sand	.....	.....	.....	.....	.....
Wilson	200	12–26	Wilson	Sand	Miocene	1200	3300	150	Faulted Anticline

ARGENTINA

Government Agency's Production Climbs in Keeping With Restrictive Policies Toward Private Firms

ARGENTINA'S oil output rose slightly in 1951 to 24,407,183 barrels, 1,045,482 barrels more than was produced in the previous year. In line with the trend established under restrictive government policies toward the five private capital producers, production by Yacimientos Petroliferos Fiscales, the government company, rose to 18,549,241 barrels while that of the private companies showed a further decline. Their yield dropped to 5,857,942 barrels.

YPF in 1950 reported the discovery of a new field on the Argentina side of Tierra del Fuego at the tip of the continent. The government announced that it was yielding oil at the rate of 62 barrels daily. While the government will not make available statistics on its petroleum operations, complete data from private sources in Argentina do not show such a field as producing oil in either 1950 or 1951.

Complete drilling data for both years was unavailable; however, production reports for the two years made available to WORLD OIL show crude production from only previously known fields.

Private companies have been prohibited from extending their holdings since an amendment to the 1935 Mining Code limits them to acreage obtained in 1925 unless these companies would agree to form a subsidiary to own new acreage. Controlling interest in such a company would be held by the Argentina government. No such subsidiaries have been formed, and no private company exploration has been conducted since before the war.

Ramos, a 1937 discovery by Standard Oil Company S. A. Argentina, was the last new field brought in by a private capital company. The last known YPF discovery was the Canodon Seco field in 1945. Canodon Seco has been the principal factor behind YPF's increased production. The government company's output in two other regions also has shown small increases.

Diadema Argentina S. A. de Petroleo (Royal Dutch-Shell), the only company for which detailed statistics are available, curtailed its drilling program in its single field, Kilometro 27, to 19 wells in 1951. Of those wells, 16 were completed as producers. In the previous year, Diadema completed 30 wells and 28 producers.

At the close of the year, 439 (one flowing) wells were producing in Kilometre 27, up 14 from those producing at the end of 1950. Yet, total output for the year dropped to 3,396,228 barrels from 3,452,850 barrels in 1950.

Standard of Argentina produced 582,910 barrels of oil in 1951 from seven fields. That was a decline of 69,327

Oil Production and Producing Wells in Argentina

PROVINCE and FIELD	Company	Year of Discovery	CRUDE OIL PRODUCTION— (Barrels) Daily Average 1951	Year 1950	Year 1951	Cumulative Through 1951
GOBERNACIÓN MILITAR COMODORO RIVADAVIA:						
Astra	Astra Cia Argentina de Petroleo	1914	3,488	1,278,379	1,273,222	28,895,184
Comodoro Rivadavia	Yaciminetos Petroliferos Fiscales (Y.P.F.)	1904	26,027	9,264,323	9,499,964	212,767,350
José Segundo	Cia. Ferrocarrilera de Petroleo	1922				703,354[1]
Marantiales Rosales	Cia. Ferrocarrilera de Petroleo	1922				7,972,323[1]
Kilometro 8	Cia. Ferrocarrilera de Petroleo	1915	1,639	742,239	598,128	25,898,974[1]
Reserva	Cia. Ferrocarrilera de Petroleo	1928				139,638[1]
Sindicato	Cia. Ferrocarrilera de Petroleo	1928				1,161,562[1]
Solano	Cia. Ferrocarrilera de Petroleo	1924				3,256,113[1]
Kilometro 27	Diadema Argentina S. A. de Petroleo	1925	9,340	3,452,850	3,396,228	77,796,380
MENDOZA:						
El Sosneado	Cia. Rio Auter "El Sosneado"	1926	20	8,103	7,454	406,500
Mendoza (Barrancas and Lunlunta)	Y.P.F.	1938	11,025	3,884,740	4,024,298	39,073,299
Tupungata	Y.P.F.	1933				
GOBERNACION DE NEUQUÉN:						
Dadin	Standard Oil Co. S.A. Argentina	1925	250	104,420	91,302	8,362,654
Plaza Huincul	Standard Oil Co. S.A. Argentina	1924	284	120,012	103,648	5,054,479
Plaza Huincul	Y.P.F.	1924	5,643	2,311,120	2,059,968	28,186,228
Challacó	Y.P.F.	1940				
SALTA:						
Agua Blanca	Standard Oil Co. S. A. Argentina	1926	49	16,920	17,816	1,362,921
Cerro Tartagal	Standard Oil Co. S. A. Argentina	1927	24	9,566	8,636	132,891
Lomitas	Standard Oil Co. S. A. Argentina	1927	153	57,083	55,844	3,604,342
Ramos	Standard Oil Co. S. A. Argentina	1937	5	5,400	1,751	85,002
San Pedro	Standard Oil Co. S. A. Argentina	1928	832	338,836	303,913	15,615,723
Rio Pescado	Y.P.F.	1933				
Tranquitas	Y.P.F.	1928	1,474	376,402	538,084	10,931,494
Vespucio	Y.P.F.	1928				
CALETA OLIVIA:						
Cañodón Seco	Y.P.F.	1945	6,649	1,391,308	2,426,927	6,531,111
Total			66,902	23,361,701	24,407,183	477,937,522

[1] Cumulative through 1949. Production of individual fields in 1950 and 1951 not available.

barrels from the previous year. This decrease resulted despite addition of 42 wells in these fields during 1951. This addition brought the number of wells capable of producing to 172 at the end of 1951.

Field drilling and maintenance of existing production facilities of the private companies were limited because of tight foreign exchange control of the government which permits no imports of oil field equipment except that brought in by the government from non-dollar areas, principally Italy and West Germany.

Early in 1952, The Texas Company and Socony-Vacuum Oil Company completed negotiations for the sale to the Argentina government of their jointly-owned subsidiary, Utramar S. A. Petrolera Argentina. The subsidiary operated a 6000-barrel-a-day refinery at Dock Sud in Buenos Aires.

The decision by the companies to abandon operations in Argentina stemmed from government foreign currency exchange controls which set a limited quota on crude that could be imported by private companies. Ultramar said these restrictions prevented it from importing required sweet crude for its refinery. Argentina said it would pay Ultramar $5,355,000 for its properties in blocked pesos.

With a lack of new discoveries of oil and but a small hike in annual output, Argentina has been forced to depend on larger volumes of imported petroleum for its rapidly-growing domestic markets. Total 1951 imports were at a record rate of 110,000 barrels a day, of which crude imports accounted for 60,400 barrels daily. This crude import volume nearly equalled the domestic crude production rate, which averaged 66,864 barrels a day for the year.

PIPE LINES OF ARGENTINA

Yacimientos Petroliferos Fiscales (Argentina Government): 15,725-barrel-a-day, 3.7-mile, 8-inch crude line from El Tordillo to El Trebol.
18,870-barrel daily, 6.8-mile, 8-inch crude line from El Trebol to Escalante.
22,000-barrel-per-day, 8.9-mile, 8-10-inch crude line from Escalante to Canadon Perdido.
28,300-barrel-a-day, 5.8-mile, 7-8 and 9-10-inch crude line from Canadon Perdido to Kilometro 9.
6000-barrel daily, 11-mile, 6-inch crude line from Canadon Seco to Caleta Olivia.
25,160-barrel-per-day, 6-mile, 8-inch crude line from Kilometro 9 to Caleta Cordova.
25,160-barrel-a-day, 3.5-mile, 9-10-inch line from Kilometro 9 to Kilometro 5.
25,160-barrels daily, 2.3-inch, 8-10-inch line from Kilometro 5 to Kilometro 3.
6290-barrels daily, 2-7 mile, 5-inch crude line from Campamento Sur to Kilometro 3.
12,580-barrel-a-day, 8.9-mile, 6-8-inch crude line for Manantiales Behr to C. Perdido.
9500-barrel-per-day, 3.9-mile, 4-6-inch crude line from Neuquen field to Est. Challaco.
18,870-barrels daily, 10.4-mile, 8-inch crude line from Tupungato to Est. Anchoris.
3100-barrels-a-day, 9.3-mile, 3-4-inch crude line from Barrancas to Agrelo.
3775-barrel-daily, 16.8-mile, 4-inch crude line from Rio Pescado to Oran.
1885-barrel-per-day, 3.7-mile, 3-inch crude line from Tranquitas to Vespucio.
409-mile crude line from Huincul to Bahia Blanca under construction.

Standard Oil Company: 1400-barrel daily, 3-inch, 7.4 mile crude line from Huincul to Dadin.
3800-barrel-per-day, 8.9-mile, 3-4-inch crude line from Dadin to Challaco.
1195-barrel-a-day, 41.5-mile, 3-inch crude line from Agua Blanca to Rio Pescado.
2245-barrel-per-day, 16.6-mile, 4-inch crude line from San Pedro to Lomitas.
2245-barrels daily, 3.8-mile, 4-inch crude line from Lomitas to Vespucio.
2245-barrels-a-day, 45.8-mile, 4-5-inch crude line in series from Vespucio to Hickman.
377-barrel-a-day, 37-mile, 4-inch crude line from Hickman to Elordi.
377-barrel-a-day, 19.1-mile, 1½-inch crude line from Ramos to Aguay.
75.4-barrel-per-day, 3.1-mile, 1½-mile crude line from Tartagal to Zanja Honda.
350 Mcf daily, 21.7-mile, 2-inch gas line from San Pedro to Tartagal, connecting with Comodoro Rivadavia-Buenos Aires gas line.
800 Mcf. daily, 7.4-mile, 3-inch gas line from Huincul to Dadin.

"Astra," Compania Argentina de Petroleo, S. A.: 22,680-barrel daily, 4-8-mile, 8-inch crude line from Comodoro Rivadavia field to C. Cordova.
12,580-barrel-per-day, 9.3-mile, 6-inch crude line from Kilometro 23 to Comodoro Rivadavia field.

Diadema Argentina, S. A. de Petroleo (B. P. M. Shell): 15,750-barrel daily, 13.6-mile, 6-inch crude line from Kilometro 27 to Caleta Olivares.

Compania Ferrocarrilera de Petroleo (YPF): 12,580-barrel-a-day, 7.5-mile, 6-inch crude line from Manantiales Rosales to Kilometro 8.
12,580-barrel-per-day, 4.7-mile, 8-inch crude line from Kilometro 8 to C. Cordova.
12,580-barrels daily, 3.7-mile, 6-inch line from Kilometro 8 to Kilometro 3.
12,580-barrel-a-day, 18.6-mile, 6-inch line from Mina Solano to Kilometro 8.

Direccion General del Gas del Estado: 35 Mmcf.-a-day, 1000-mile, 10-inch gas line from Comodoro Rivadavia to Buenos Aires.
37.2-mile, 3-4-inch gas line from Tupungato to Mendoza.
37.2-mile, 6-inch gas line from La Plata to Buenos Aires.
5 Mmcf.-a-day, 16-mile, 10-inch gas line from Kilometro 27 to Kilometro 12 under construction.
65-mile, 10-inch gas line from Canadon Seco to Kilometro 12 under construction.
17.5 Mmcf.-a-day, 310-mile, 8-inch gas line from Huincul to General Conessa, south of Bahia Blanca.

Comodoro Rivadavia Direccion General: 62-mile gas line from Caleta Olivia to Comodoro.

REFINERIES OF ARGENTINA

Esso Refinadora de Petroleo, S. A. (Standard Oil Company of New Jersey):
25,000-barrel-a-day thermal cracking plant at Campana, near Buenos Aires.
5500-barrel-per-day thermal cracking plant at Bahia Blanca.
1250-barrel daily skimming plant at Manuel Elordi.
450-barrel-per-day skimming plant at Dadin.

Diadema Argentina, S. A. de Petroleo (B. P. M. Shell): 15,800-barrel daily skim-crack refinery at Dock Sud in Buenos Aires.
600 barrels per day lube plant at Buenos Aires projected.

Cia. Nativa de Petroleos: 17,600-barrel-per-day complete refinery at Campana, near Buenos Aires.
5000 barrels daily skim-crack refinery at Galvan.

Condor: S. A. Petrolera Argentina: 1000-barrel-a-day skim-lube refinery at Lomas de Zamora (Buenos Aires) under construction.

Lottero Papini and Company: 950-barrel-per-day skim-lube refinery at Avellaneda (Buenos Aires).

Cia. La Isaura S. A.: 1900-barrels daily skimming plant at Loma Faraguayo (Bahia Blanca).

Standard Oil Company S. A. Argentina: 1100 barrels daily skimming plant at Manuel Elordi.
330-barrel-a-day skimming plant at Plaza Huincul.

Ultramar S. A. Petrolera, Argentina: 5000-barrel-per-day complete refinery at Dock Sud-Avellaneda (Buenos Aires).

Cia. General de Asfaltos: 800 barrels daily skim-lube refinery at Wilde (Buenos Aires).

Cia. Ferrocarrilera de Petroleo: 6300-barrel-per-day skim-crack refinery at Comodoro Rivadavia.

Ragor Compania, S. A.: 500 barrels a day skim-lube plant at Quilmes (Buenos Aires).

Yacimientos Petroliferos Fiscales (Argentina Government): 71,000 barrels daily complete refinery at La Plata.
18,000 barrels a day comb. unit at San Lorenzo.
3800-barrel daily comb. unit at Lujan de Cuyo.
2100-barrel-per-day comb. unit at Chachapoyas.
1130-barrel-a-day skim-crack plant at Plaza Huincul (Neuquen).
28,000-barrel daily comb. unit, asphalt refinery at Buenos Aires.

Argentina Crude Oil Production by Regions, YPF and Private Companies, for Recent Years

YEAR	COMODORO RIVADAVIA*		NEUQUÉN		SALTA		MENDOZA		TOTAL		GRAND TOTAL
	YPF	Private[1]	YPF	Private[2]	YPF	Private[2]	YPF	Private[3]	YPF	Private	
Prior to 1944	137,499,041	109,289,709	10,724,155	10,975,559	6,514,912	16,636,947	12,604,982	319,236	167,343,090	128,221,451	295,564,541
1944	10,226,615	6,875,895	1,923,249	445,005	961,366	682,081	3,094,396	21,292	16,205,626	8,024,273	24,229,899
1945	9,722,422	6,411,096	1,964,141	382,061	665,281	618,949	3,102,020	14,999	15,453,864	7,427,105	22,880,969
1946	8,747,176	5,680,285	1,936,628	343,962	466,586	556,074	3,063,475	8,214	14,213,865	6,588,535	20,802,400
1947	9,913,889	5,789,870	2,024,889	295,039	471,436	494,388	2,847,540	8,800	15,257,754	6,588,097	21,845,851
1948	10,532,228	5,781,416	2,429,902	304,801	503,464	513,835	3,178,318	8,762	16,643,912	6,608,814	23,252,726
1949	10,075,102	5,618,867	2,442,155	251,512	434,111	482,858	3,277,442	8,553	16,234,301	6,360,918	22,595,219
1950	10,657,786	5,471,313	2,311,120	224,432	376,402	427,805	3,884,740	8,103	17,230,046	6,131,655	23,361,701
1951	11,926,891	5,267,578	2,059,968	194,950	538,084	387,960	4,024,298	7,454	18,548,505	5,859,678	24,408,183

* Includes Yacimientos Petroliferos Fiscales (YPF) production from Cañodón Seco field in Caleta Olivia district for 1951. [1] Astra Cia. Argentina de Petroleo, Diadema Argentina S.A. de Petroleo, and Cia Ferrocarrilera de Petroleo. [2] Standard Oil Co. S.A. Argentina. [3] Cia. Rio Autel "El Sosneado."

BOLIVIA

Opening of Refinery Prompts Bolivia to Modify Laws in Effort to Increase Exploitation of Reserves

OPENING in April, 1951, of the refinery at Cochabamba, a 5000-barrel daily capacity plant, spurred the Bolivian government to modify its oil laws in an effort to encourage further exploitation of its estimated 19-million-barrel reserves.

The government hoped to develop enough local production to enable its refineries to operate at full capacity without using imported crude. But output from the three producing fields—Camiri-Guayruy in the department of Santa Cruz, and Bermejo and Sanandita in Tarija—fell short even of the 3000-barrel daily consumption rate.

Only three wells were drilled in 1951, all in Bolivia's most prolific field, Camiri. Their combined production of about 200 barrels a day brought total production from that field to 1300 barrels daily in May.

The oil development policy put into effect in 1951 was intended to permit foreign interests to participate in the Bolivian oil industry, which has been under control of the government monopoly, Yacimientos Petroliferos Fiscales Bolivianos, since 1937. The plan called for lifting restrictions, in varying degrees, on a strip of land running from the northwest frontier of Bolivia to the southern extremity. The northernmost section was made available for exploration on the basis of direct negotiation with the government; the central section, which contains Camiri field, was virtually unaffected; and the southernmost, between Camiri and the Argentine border, was made available for development under lease from YPFB.

At year's end, the new policy had aroused little interest among foreign operators. Standard Oil Company (N. J.), which had operated in Bolivia before expropriation, denied any plans for resuming producing operations there. Preliminary talks were reported to have taken place between YPFB officials and other U. S. companies, but without result.

Bolivia Geological Data

DEPARTMENT and and FIELD	Year of Discovery	Proved Area (Acres)	Gravity of Oil (API)	Formation, Name and Kind	Geologic Age	DEPTH (Feet) Min. to Top of Pay	DEPTH (Feet) Max. to Bottom of Pay	Type of Structure
CHUQUISACA:								
*Buena Vista	n.a.	1475	43.5	Sand	Devonian	n.a.	3165	Elongated Dome
*Caigua	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	Anticline
*Camatindi	1928	1120	41.5	Sand	Devonian	2350	4300	Faulted Anticline
SANTA CRUZ:								
Camiri-Guayruy	1927	102	54	Devonian, Sandstone	Devonian	1800	2500	Anticline
*Saipuru	n.a.	740	40	Sand	Devonian	500	n.a.	Anticline
TARIJA:								
Bermejo	1924	62	26	Tupambi, Lenses	Permo-Triassic	n.a.	n.a.	Anticline
Sanandita	1926	89	43	Tupambi, Lenses	Permo-Triassic	n.a.	n.a.	Anticline
Total	....	....	....	.....	.....	....	....	.....

Note: All fields operated by Yacimientos Petroliferos Fiscales Bolivianos.
n.a.—Not available. * Inactive.

BOLIVIAN PIPE LINES

Yacimientos Petroliferos Fiscales Bolivianos: 327-mile, 6-inch crude line from Camiri field to Cochabamba.
44 miles of 4- and 6-inch spur line from Tapirani to Sucre.

BOLIVIAN REFINERIES

Yacimientos Petroliferos Fiscales Bolivianos: 1447-barrel-per-day topping plant at Camiri.
3000-barrel-per-day topping plant at Sucre (Mesa Verde).
944-barrel-per-day topping plant at Sanandita.
5000-barrel-per-day reforming plant at Cochabamba (Valle Hermoso).

BRAZIL

1951 Production of Approximately 1800 Barrels Is Less Than 1 Percent of National Consumption

AVERAGE daily oil production in Brazil during 1951 was little more than 1800 barrels, amounting to less than 1 percent of the national rate of consumption, according to Conselho Nacional do Petroleo (CNP), the government oil producing agency.

One of the least developed of the world's oil areas, Brazil has good geological potentialities for crude accumulation. Through 1951, however, its production had come only from the Bahia Basin, a graben about 25 miles wide and 124 miles long, on the East Coast. CNP predicted that oil was also to be found in the state of Sao Paulo and possibly Parana, and planned an intensified drilling program to begin in early 1952.

There were 85,498 feet of hole drilled in Brazil in 1951, a 20.5 percent increase over the 70,934 feet drilled in 1950. Exploratory drilling resulted in three small fields, all in the Bahia Basin.

Early in the year, a discovery well at Almas, about 2.8 miles east of Candeias field in Bahia, was producing about 950 barrels daily from 3770 feet. Another successful wildcat, completed in July at Agua Grande, had an indicated production of about 300 barrels a day from 4250 feet. July also saw the discovery of the Rio da Serra field. Limits of the national reserve were moved northward to the San Francisco River to enclose the

new discoveries as well as additional potentially productive areas.

In a move to expand its petroleum industry, Brazil placed an order for $8 million in drilling material with the International Trade Bureau of Washington, D. C., in April, 1951. Later, President Getulio Vargas proposed a state oil company to explore, produce, refine, market and transport Brazilian oil. Under his plan, the government would own 51 percent of the $500 million organization, while owners of gasoline vehicles, planes and boats would be forced shareholders, through taxes.

Further strengthening its position in oil supply, Brazil took steps to transform the country from an importer of refined products into a refiner of imported crude. Projected construction by the government of a 45,000-barrels-a-day refinery and three private refineries totaling 55,000 barrels a day would raise refining capacity approximately to the consumption rate.

No definite action was taken on whether foreign capital would be encouraged to invest in Brazilian oil prospecting, and the government's attitude apparently was mixed. President Vargas praised the restrictive oil laws because they had preserved for the country one of its most valuable resources, but later said it was the government's intention to make it easier for private foreign capital, especially in joint ventures with national capital, to engage in Brazilian oil operations.

REFINERIES OF BRAZIL

Conselho Nacional do Petroleo: 2500-barrel-a-day cracking plant at Mataripe, Bahia. M. W. Kellogg Company and Kellogg Pan American Corporation have contract to double capacity of Mataripe plant.
45,000-barrel-a-day thermal cracking refinery at Cubatao, Sao Paulo, under construction by Pan American Hydrocarbon Research, Inc.
Distilaria Rio Grandense: 500-barrel-a-day plant at Rio Grande do Sul, operating.
Industria Materazzo de Energia: 1000-barrel-a-day skimming plant at Sao Paulo, operating.
Ip'ranga S. A. Ind. Brasileira de Petroleo: 1000-barrel-a-day skimming plant at Rio Grande do Sul, operating.
Refinaria de Exploracao do Petroleo Uniao: 25,000-barrel-a-day thermal cracking refinery at Capuava, Sao Paulo, under construction by Pan American Hydrocarbon Research, Inc.
Refinaria de Petroleo do Manguinhos: 10,000-barrel-a-day thermal cracking plant at Manguinhos, Distrito Federal, being planned by M. W. Kellogg Company.
Private Brazilian Interests: 20,000-barrel-a-day refinery at Niteroi, Rio, in planning stage.

PIPE LINE OF BRAZIL

Estrado de Ferro Santos-Jundai: 18-, 14-, 10- and 6-inch products line from Alamoa, Santos, to Utinga, Sao Paulo, put in operation in October, 1951.

Brazil Oil Production and Geological Data

STATE and FIELD	Year Discovery	CRUDE OIL PRODUCTION (Barrels) Year 1950	Year 1951	Cumulative Through 1951	Proved Area (Acres)	Gravity of Oil (API)	Formation, Name and Kind	Geologic Age	DEPTH (Feet) Min. to Top of Pay	Max. to Bottom of Pay	Avg. Thickness (Feet)	Type of Structure
BAHIA:												
Agua Grande	1951	....	243*	243*	n.a.	n.a.	n.a.	n.a.	n.a.	4250	n.a.	n.a.
Almas	1951		2,142*	2,142*	n.a.	n.a.	Sergi, Sand	Cret.	3714	3770	56	n.a.
Aratú	1942	1,048	199*	57,394*	74	42	Santo Aamro, Sand	Cret.	1312	1968	66	Anticline
Candeias	1941	321,283	433,537	1,196,493*	1,200	26	Santo Amaro, Sand	Cret.	2461	3937	33	Anticline
Dom João	1947	6,114	712*	23,708*	750	39	Santo Amaro, Sand	Cret.	886	1313	131	Anticline
Itaparica	1942	9,563	5,384*	18,399*	148	30	Santo Amaro, Sand	Cret.	1968	2461	33	Anticline
Lobato-Joanes	1939	667	.....	72,133	30	35	Santo Amaro, Sand	Cret.	1312	1706	82	Faults
Pitanga	1945	.....	.....	401	n.a.	26	Santo Amaro, Sand	Cret.	4865	n.a.	8	Anticline
Ria da Serra	1951	.....	125*	125*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Total	....	338,675	756,627*	2,515,019*	....							

Note: All fields operated by Conselho Nacional do Petroleo. n.a.—Not available.
* Individual field production statistics include only January through August data for 1951. Totals include data for all Brazilian fields for entire year.

CHILE

ENAP Pays Off in Second Year of Operation As Oil Production Rises to 759,710 Barrels

CHILE'S new oil administrative agency, Empresa Nacional del Petroleo (ENAP), which was developed in 1950, continued its second year of quickening development. The change from the setup in which the government's Corporacion de Fomenta was in charge of developing Chile's production paid off. The nation's 1951 production rose to 759,710 barrels from its 1950 output of 630,950.

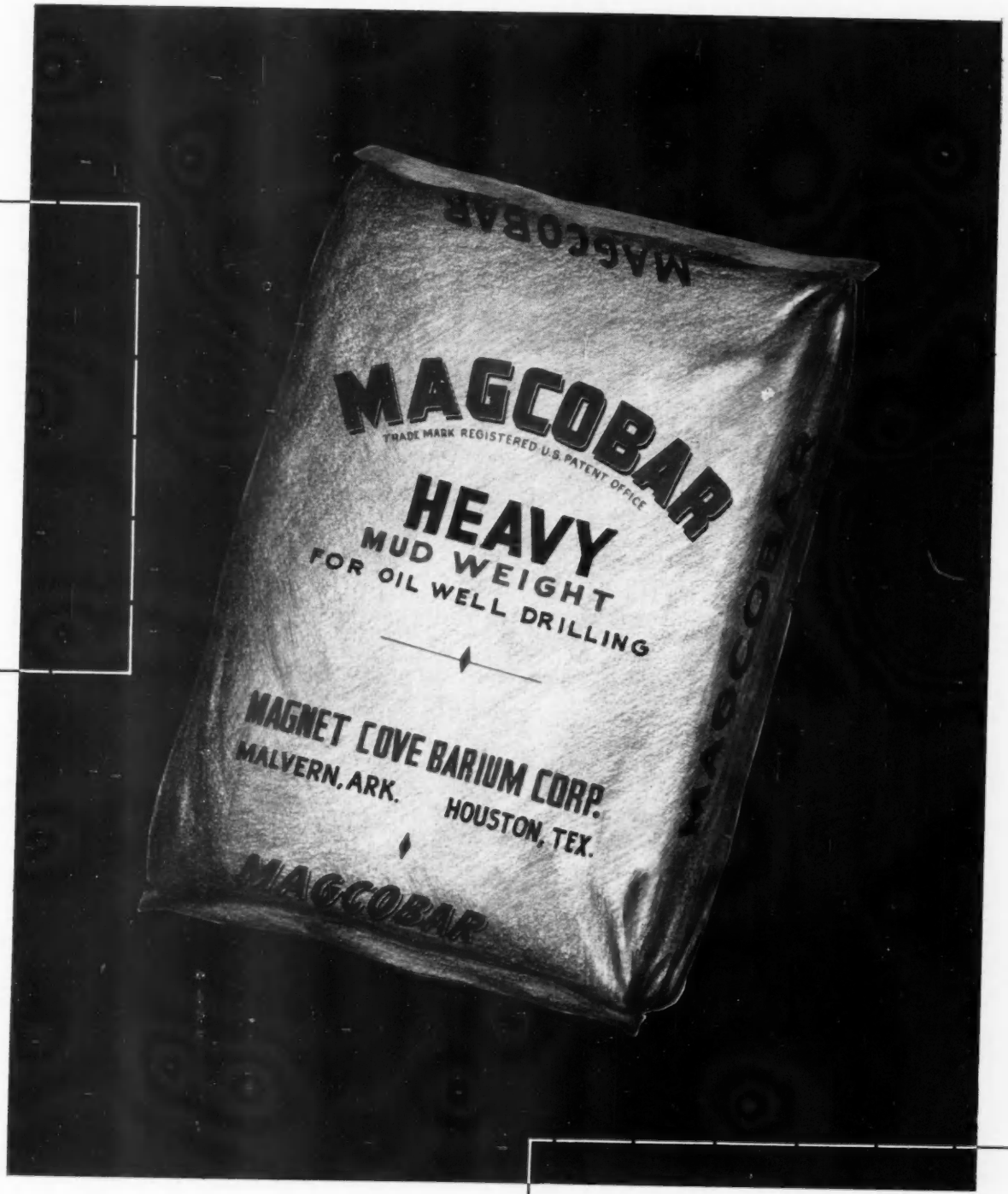
This yield was built on a daily average production of 2081 barrels from estimated reserves of 30 million barrels and 2600 acres of proven territory. Daily average output at the end of the year amounted to 2315 barrels.

Cumulative production of 1,444,875 barrels through 1951 has all been obtained from the Springhill sand of the Cretaceous. Depths of the wells range from a minimum of 6900 feet to the top of the pay in Espora field to a maximum of 7600 feet to the bottom of the pay in Victoria Norte and Victoria Sur fields.

During the year, Cerro Sombrero field was subdivided into Chanarcillo, Victoria Sur, Sombrero, and Victoria Norte. No intercommunication between these different fields is believed to exist.

Empresa Nacional discovered gas production in mid-year on the mainland across the Magellan Straits from Cerro Manantiales field. The exploratory well was at Punta Delgado. Cable tool tests were drilled on the southern Chilean mainland several years ago, but this well was reportedly the first drilled with rotary equipment.

As the year ended, several wells were being capped to prevent gas pressure loss, and production was expected to rise sharply following completion of a plant early in 1952 which would permit repressuring the Magallanes



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fields. In August Empresa negotiated a short-term $2 million credit from a U. S. bank to begin work on a refinery to be erected on the coast, near Valparaiso.

Only one Cerro Manantiales well was producing at the end of the year. The remaining 17 oil wells were shut in for conservation reasons and were awaiting the opening of a gasoline plant. Four Victoria Sur field oil wells were also shut in awaiting the plant's opening. However, one of the four was to be used as an input well.

Drilling in Chile

PROVINCE and FIELD	WELLS COMPLETED IN 1950 Oil	Gas	Dry	Wells	WELLS COMPLETED IN 1951 Oil	Gas	Dry	Wells	Wells Drilling End of 1951
MAGALLANES:									
Manantiales	4	1	2	7	18	8	9	35	
Espora						1	1	2	
Angostura						1		1	
Chañarcillo						2	1	3	
Victoria Norte	3	2	1	6	2	1		3	
Victoria Sur					8			8	2
Sombrero					2			2	1
Delgada					1	2		3	1
Wildcats		2		2					1
Total	7	5	3	15	31	15	11	57	5

Cerro Sombrero field was subdivided in 1951 into Chañarcillo, Victoria Sur, Sombrero, and Victoria Norte fields. Empresa believes no intercommunication between these fields exists.

CHILE PIPE LINES

Corporacion de Fomento de la Produccion (ENAP): 10,000 barrels daily, 42.5 miles, 8-inch crude line from Cerro Manantiales to Caleta Clarencia.

Corporacion de Fomento de la Produccion (ENAP): Proposed line 10,000-barrel daily, 14-mile, 6-inch crude line from Cerro Sombrero to Cerro Manantiales to include 14-mile, 6-inch line from Cerro Sombrero to Cerro Menantiales and 14-mile, 8-inch line from Cerro Sombrero to Cerro Manantiales.

CHILE REFINERIES

Empresa Nacional del Petroleo: 20,000-barrels-a-day complete plan refinery at Concon, 12 miles north of Valparaiso.
125 barrels daily, skimming refinery at Coquimbo.
60-barrel-a-day skimming refinery at Talcahuano.
175 barrels daily skimming refinery at Vina del Mar.
20,000-barrel-a-day refinery planned at Concon, 12 miles north of Valparaiso.

Corporacion de Fomento de la Produccion: 6000-barrel-per-day refinery at Tierra del Fuego.

Johannsen, C. H.: 125 barrels daily skimming refinery at Coquimbo.

Maritano Miguel: 60-barrel-per-day skimming refinery at Talcahuano.

Soc. Establecimientes Quimicos: 175 barrels daily, skimming refinery at Vina del Mar.

Corporacion de Fomento de la Produccion: 6000 barrels daily refinery at Tierra del Fuego, south of Magellan Straits. Gas processing added with 30 million cubic feet daily capacity.

M. W. Kellogg: 20,000-barrel daily, thermal cracking topping, thermal reforming refinery under construction at Concon. Completion end 1953.

Chile Oil Production and Geological Data

PROVINCE and FIELD	Year of Discovery	Producing Wells End of 1951 Flowing	Art. Lift	Total	Crude Oil Production (Barrels) Daily End of 1951	Year 1950	Year 1951	Cumulative Through 1951	Proved Area (Acres)	Gravity Oil (API)	Formation Name and Kind	Geologic Age	Depth (Feet) Min. to Top of Pay	Max. to Bottom of Pay	Avg. Thickness of Pay (Feet)	Type of Structure
MAGALLANES:																
Cerro Manantiales	1945	1	...	1	60	586,680	146,810	787,810	750	42-45	Springhill Sand	Cretaceous	7350	7550	65	Anticline
Victoria Sur	1950	4	....	4	1,200	44,270	370,695	414,860	850	40-42	Springhill Sand	Cretaceous	7500	7600	100	Anticline
Sombrero	1950	2	....	2	950	.....	226,075	226,075	500	40-42	Springhill Sand	Cretaceous	7350	7500	135	Anticline
Chañarcillo	1950	1	....	1	40	.....	1,695	1,695	250	42-45	Springhill Sand	Cretaceous	7200	7500	60	Anticline
Victoria Norte	1950	1	...	1	50	.....	12,960	12,960	250	42-45	Springhill Sand	Cretaceous	7300	7600	80	Anticline
Espora	1949	1	.....	1	15	...	1,475	1,475	...	42-45	Springhill Sand	Cretaceous	6900	7000	100	Anticline
Total	....	10	...	10	2,315	630,950	759,710	1,444,875								

* Seventeen oil wells in Manantiales field and four Victoria Sur field wells were shut in at the close of the year for conservation reasons, awaiting the opening of a gasoline plant. One Victoria Sur well will be used as an input well.

COLOMBIA

Crude Production Soars to Record 38,148,000 Barrels and De Mares Concession Reverts to State Ownership

OIL HISTORY was made in Colombia in 1951. Crude production soared to a new high of 38,148,929 barrels, or .91 percent of the world total. That was a rise of 4,089,586 barrels from 1950. And Tropical Oil Company's De Mares Concession reverted to the state-owned enterprise, Empresa Colombiana de Petroleos, in August—the first time important oil installations have reverted to the state at no cost.

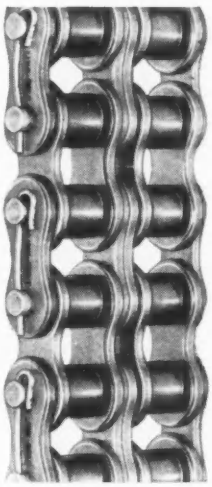
On the basis of incomplete statistical reports from operating companies, 1450 wells were producing oil at the end of the year, 157 of which were flowing. Yondo Concession at Casabe field reported 259 producing at the year's end. Concessionaira de Petroleo Shell-Condor operates the concession.

Barco Concession in Norte de Santander reported 123 oil wells producing at the end of 1951. Colombian Petroleum Company (The Texas Company-Socony-Vacuum Oil Company) operates this concession. Des Mares concession at Santander had a total of 1042 wells producing at year's end. The number of flowing wells was unreported.

While production was emphasized, drilling slipped during the year. One hundred wells were completed during 1951. In 1950, 104 wells were completed. Footage consequently, dipped to 465,351 feet in 1951 from 487,607 feet the previous year.

However, exploratory drilling increased during the year to three wildcats, with a footage of 27,405 feet as compared to two wells and a footage total of 10,823 feet the previous year. All three wildcats were producers. The two tests drilled in 1950 were failures. At the close of the year, ten field wells were drilling, and three wildcats were in operation.

Though Tropical Oil's De Mares Concession reverted



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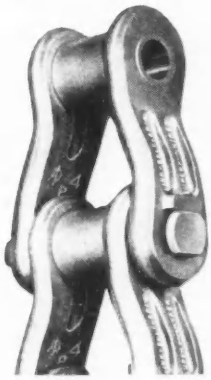

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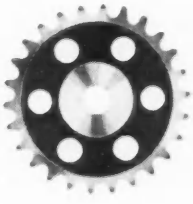

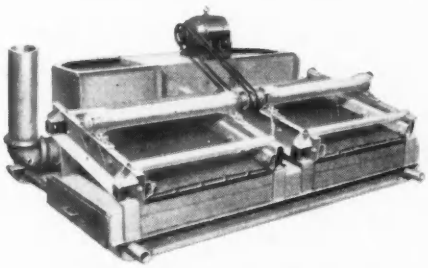

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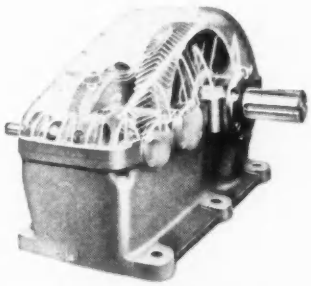

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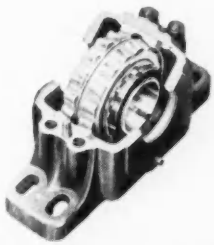

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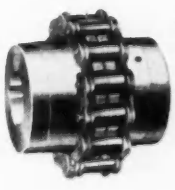

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to the government in August, the company continued until that time a recompletion effort which arrested a natural decline in production and increased the concession yield with no new drilling. The program was begun in 1946.

In addition to the reconditioning program which was concluded in 1951, Tropical drilled 13 new wells in De Mares' A zone as a result of favorable reconditioning work in La Cira's western section. There, sands of the A zone are better developed.

PIPE LINES OF COLOMBIA

South America Gulf Oil Company (Socony-Vacuum Oil Company, Inc., and The Texas Company): 28,000-barrel-a-day, 263-mile, 12-inch crude line from Petrolea to Covenas.

Andean National Corporation, Ltd. (Standard Oil Company of New Jersey): 65,000-barrel daily crude line system composed of 334.5 miles of 10-inch line from El Centro to Mamonal, a 263.8-mile, 10-inch loop, 54 miles of 12-inch loop, and 15 miles of 10-inch third loop, totaling 615± miles of 10-inch and 54 miles of 12-inch line.

Concesionaria de Petroleo Shell-Condor (Shell Oil Company): 12,000-barrel-per-day (8000 barrels minimum), 55-mile, 6- and 10-inch (in series) crude line from Dificil to Plato.
50,000-barrel daily (43,500 barrels minimum), 6-mile, 10-inch crude line from Casade to Galan.

Colombian Ministry of Petroleum: projected 75-mile, 4-inch products line from Buena Ventura to Cali.
Projected 90-mile, 6-inch products line from Pto. Berrio to El Dorado.
Projected 113-mile, 6-inch products line from Pto. Berrio to Medellin.

Department of Cundinamarca: 22,000-barrel-a-day (8850 barrel minimum), 87-mile, 6⅝-inch products line from Pto. Salgar to Bogota.

Troco (Tropical Oil Company) Products Line (International Petroleum Company): 7500-barrel daily, 65-mile, 6-inch products line from Pto. Berrio to El Centro.

REFINERIES OF COLOMBIA

Empresa Colombiana de Petroleos: 25,000-barrel-a-day refinery, including topping plant, catalytic cracking, alkylation and acid recovery plants, at Barrancabermeja. Planned refinery expansion will increase capacity to 35,000 barrels daily.

Colombian Petroleum Company: 900-barrel daily skimming plant at Petrolea.

Concesionaria de Petroleo Shell-Condor: 20 million cubic foot daily natural gasoline plant at Dificil under construction.

Colombian Government: 1000-barrel daily pilot plant at Tolima planned.

Drilling in Colombia

DEPARTMENT and FIELD	WELLS COMPLETED IN 1950				Wells Completed in 1951	Footage Completed in 1951
	Producing	Dry	Total Wells	Total Footage		
FIELD WELLS:						
ANTIOQUIA:						
Casabe	69	..	69	294,827	78	322,618
BOLIVAR:						
Cantagallo	..	..	..	.....	..	.....
BOYACA:						
Velâquez	2	1	3	23,134	7	51,752
TOLIMA:						
Tetuan	2	1	3	10,805	2	7,926
MAGDALENA:						
El Dificil	1	..	1	9,516	.....	.....
NORTE DE SANTANDER:						
Barco Fields	24	2	26	138,592	10	55,650
Wildcats	..	2	2	10,823	3	27,405
Total	98	6	104	487,697	109	465,351

Colombian Oil Production and Geological Data

DEPARTMENT, Concession and Field	Year of Discovery	NUMBER OF PRODUCING OIL WELLS			CRUDE OIL PRODUCTION (BARRELS)				Proved Area (Acres)	Gravity of Oil (API)	Formation, Name and Kind	Geologic Age	DEPTH (Feet)		Avg. Thickness of Pay (Feet)	Type of Structure
		Flowing	Art. Lift	Total	Daily at End of 1951	Year 1950	Year 1951	Cumulative Through 1951					Min. to Top of Pay	Max. to Bottom of Pay		
ANTIOQUIA:																
Yondó Concession:																
Casabe[1]	1941	62	197	259	37,839	9,670,608	12,832,905	44,025,613	5,000	20.6	"A" "B" and "C" sands	Miocene Oligocene, Eocene	"A"—2100 "B" "C"—3720	3970 5660	....	Unconsolidated Sands
BOLIVAR:																
Cantagallo Concession:																
Cantagallo[1]*	1943	3	1	4	1,227	440,491	429,606	1,760,122	550	21	"C" Sands, Toro, Lisama	Eocene-Cret.	4250	6810	.....	Unconsolidated Sands
Floresanto Concession:																
Sinú[2]				ABANDONED (NON-COMMERCIAL)					.....	.....	.....	.....	.....	.....	.....	.....
BOYACA:																
Teran-Guaguaui Concession:																
Velasquez[3]	1946	8	0	8	689	393,842	461,328	1,182,862	400	25.3–27.3	Sand	Tertiary	6700	8445	85	Anticline
TOLIMA:																
Chaparral-Ortega Concession:																
Tetuan[3]	1949	1	0	1	30	7,700	5,122	13,972	936 (est.)	21-28.1	.....	.....	.....	.....	.....	.....
NORTE DE SANTANDER:																
Barco Concession[4]:																
Carbonera	1939								500	22	Cuervos Barcon, Sands	Eocene	U.A.	3359	10	Faulted Anticline
Petrolea	1933								4,200	45	La Luna Limestone	Cret.	99	1953	33	Anticline
Río de Oro	1920								420	38	Catatumbo, Sand, Shale	Cret.	n.a.	1865	21	Faulted Anticline
Tibú Cret.	1942	70	53	123	24,495	9,394,307	10,103,735	73,474,117	18,590	45 32	Barco Shale, Limestone	Tertiary, Cret.	4306	10,876	100	Anticline
Tibú Tert.	1940								n.a.	45	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
N. Sardinata	1951								n.a.	32	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
S. Sardinata	1951															
SANTANDER:																
DeMares Concession:																
Colorado	1945								270	37.6	Colorado, Sand	Eocene	3400	4200	200	Faulted Anticline
Galán	1945								426	19.5	Zone A Sand	Oligocene	3900	4050	125	Faulted Anticline
Infantas	1916	n.a.	n.a.	1,042	35,881	14,984,499	13,591,089	416,978,870	5,750	26.3	Zones A, B, C, Sand	Eocene-Oligocene	300	2600	390	Faulted Anticline
La Cira	1926								12,265	24.5	Zones A, B, C, Sand	Eocene-Oligocene	200	4300	382	Faulted Anticline
Las Monas Concession:																
La Salina[2]	1926			ABANDONED (NON-COMMERCIAL)												
MAGDALENA:																
El Dificil Concession:																
El Dificil[1]	1943	13	0	13	1,748	1,093,307	725,144	3,924,866	2,500	42.3	El Dificil Limestone	Oligocene	5720	5860	28	Reef Limestone
Total	.....	157[5]	251[5]	1450	101,909	26,323,816	38,148,929	541,360,422	.....	.....	.....	.....	.....	.....	.....	.....

[1] Shell Group: Concessionaria de Petroleo Shell-Condor. [2] Socony-Vacuum Oil Company. [3] Texas Petroleum Company. [4] Colombian Petroleum Company (Texas Company-Socony-Vacuum). [5] Total except for DeMares Concession. * Concession formerly held by Socony-Vacuum sold to Shell Group May 1, 1951. (Operator: Compania Anglo-Colombiana de Petroleo.)

"OILMAN'S AIRLINE"

FOR MOVING CRITICAL PARTS . . . Braniff air express and air freight can bring in equipment fast—often overnight!—save costly delays.

FOR MOVING PERSONNEL . . . convenient departures and fast schedules save time en-route. Top-notch accommodations!—men arrive ready to tackle the job.

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The map tells the story:—check the location of your own jobs on the Braniff map. See how Braniff routes and connections can speed men and Equipment from the Williston Field in the north all the way to South America. For complete information on passenger and freight rates and schedules, call your nearest Braniff office.

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ECUADOR

Daily Average Output Hiked to Boost Production; 54 Completed Wells Mark Decline from '50 Record

ECUADOR crude production in 1951 was 2,715,555 barrels, 24,572 more than the output for 1950. This production hike resulted from daily average output of 7469 barrels from 1026 producing wells.

Forty-nine oil wells were completed in Ancon field during 1951 and five in Tigre-Cautivo field for a total of 54 wells and a footage of 192,468 feet. In the previous year, 63 oil wells were completed and 14 were abandoned for a total footage of 317,348 feet. No wildcats were drilled in 1951.

On January 1, Manabi Exploration, Inc., acquired the Ecuadorian assets and operations of Ecuador Oilfields, Ltd., a subsidiary of British Controlled Oilfields, Ltd. This action resulted from the exercising of an option agreement with British Oilfields, and accomplished at a cost to Manabi of approximately $1.2 million. The transaction involved an estimated 11 million barrels of recoverable oil reserves and drilling, production, transportation, maintenance, and camp equipment with a cash replacement value of about $2 million. Efforts were successful in raising production from 1150 barrels a day at the time of acquisition to 1650 barrels daily as of April 23, 1952.

Manabi's gross crude production in 1951 from both the deep El Tigre sands and the shallow areas amounted to 520,501 barrels, or a daily average of 1408. This compares favorably with the 1362 barrels per day produced under Ecuador Oilfields operation in 1950. But it does not reflect increased production reached later in the year.

Of Manabi's total yield, 240,425 barrels were exported and 179,547 barrels were refined for sale to Ecuadorian markets. As of December 31, 1951, Manabi had in storage 59,760 barrels of exportable crude, valued at $145,644. A two-year sales contract was made with Shell Oil Company, with the latter agreeing to purchase up to 3000 barrels daily at $2.50 f.o.b. purchaser's tankers.

Ecuador's reserves of 400 million barrels are .4 percent of the world total.

ECUADOR PIPE LINES

Anglo-Ecuadorian Oilfields, Ltd.: 12,960-barrel-a-day, 8-mile, 6-inch crude line from Ancon to La Libertad.
Carolina Oil Company: 2400-barrel daily, 3-mile, 4-inch crude line from Santa Paula to Carolina.
Manabi Exploration Company, Inc. (Canada Southern Oils, Ltd.): 2500-barrel-per-day, 11-miles, 4-inch crude line from Tigre to Cautivo.
Petropolis Oil Company: 3600-barrel-a-day, 8-mile, 4-inch crude line from Salinas to La Libertad.
Ecuadorian Railroad: 15,000-barrel daily (maximum), 45-mile, 6-inch line from Bucay to Palmira products line under construction.

ECUADOR REFINERIES

Anglo-Ecuadorian Oilfields, Ltd.: 5200-barrel daily skimming plant at La Libertad, 100 miles west of Guayaquil.
Manabi Exploration Company, Inc. (Canada Southern Oils, Ltd.): 6600-barrel-a-day topping plant at Cautivo, Guayas, 90 miles from Guayaquil.

Drilling in Ecuador

PROVINCE and FIELD	WELLS COMPLETED IN 1951					Wells Drilling End of 1951	COMPLETED IN 1950				
	Oil	Dry	Gas	Total Wells	Total Footage		Oil	Gas	Dry	Total Wells	Total Footage
GUAYAS:											
Ancon	49	..	..	49	143,430	..	49	..	..	49	113,689
Carolina-Santa Paula	..	..	..	..	4,722	..	4	..	1	5	5,588
Concepcion	..	..	..	..	3,842	..	2	..	..	2	2,200
El Oro	..	..	..	..	..	..	..	..	4	4	5,169
Petropolis	..	..	..	..	7,767	..	2	..	..	2	7,103
Tigre-Cautivo	5	..	..	5	32,707	..	6	..	4	10	27,111
Wildcats	..	..	..	..	..	..	..	..	5	5	156,488
Total	54	..	..	54	192,468	0	63	..	14	77	317,348

Oil Production in Ecuador

PROVINCE and FIELD	Operating Company	Year of Discovery	Total Producing Wells End of 1951	CRUDE OIL PRODUCTION (BARRELS) Daily Average for 1951	Year 1950	Year 1951	Cumulative Through 1951
GUAYAS:							
Ancon	Anglo-Ecuadorian Oilfields, Ltd.	1921	841	5,501	1,976,685	1,990,081	42,536,984.58
Carolina-Santa Paula	Carolina Oil Co.	n.a.	50	106	46,279	38,575	1,190,317.13
Concepcion	Concepcion Ecuadorian Oilfields, Ltd.	1931	23	257	83,534	93,676	1,080,169.51
Petropolis	Petropolis Oil Co.	1937	21	197	87,924	71,822	955,903.12
Tigre-Cautivo*	Manabi Exploration Co.	1920	91	1,408	496,561	520,501	5,992,196.87
TOTAL			1,026	7,469	2,690,983	2,715,555	51,755,571.21

* Manabi Exploration Co. acquired the Ecuador Oilfields, Ltd., concession on January 1, 1951.

Engineering and Geological Data on Ecuador Oil Fields

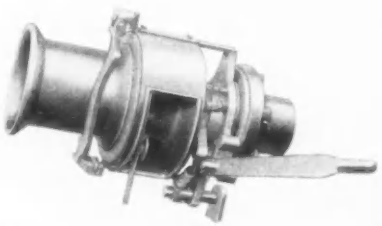
PROVINCE and FIELD	Proved Area (Acres)	Gravity of Oil (API)	PRODUCING FORMATION Name	Kind	Age	DEPTH (Feet) Minimum to Top of Pay	Maximum Total Depth of Wells	Average Thickness of Pay (Feet)	Type Structure
GUAYAS:									
Ancon-Sta. Elena	18,000	37–41	Socorro	Sandstone	Eocene	1200	4000	600	Faulted anticline
			Atlanta			3000	6000	2500	
Carolina-Sta. Paula	n.a.	28–31	Socorro	Sand	Eocene	632	836	200	Steeply dipping erratic blocks
Concepcion	n.a.	38	Atlanta	Sand	Eocene	110	3570	n.a.	Structural strat. trap
El Cautivo	n.a.	39–44	Socorro	Sand	Eocene	750	1000	250	Steeply dipping erratic blocks
El Oro	n.a.	n.a.	n.a.	Lime	Pleistocene	n.a.	n.a.	n.a.	n.a.
El Tambo	....	....	Socorro	Sand	Eocene	....	4000	....	Structural strat. trap
El Tigre	200	39	Atlanta	Sand	Eocene	2900	4300	400	Structural strat. trap
Petropolis	100	35	.....	Shattered Chert	Eocene	....	2000	....	Steeply dipping erratic blocks

n.a —Not Available.

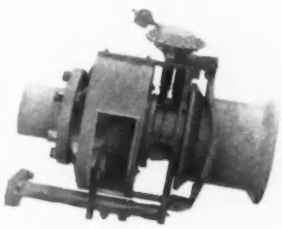
FOSTER CATHEADS

"FIRST CHOICE OF THE INDUSTRY"

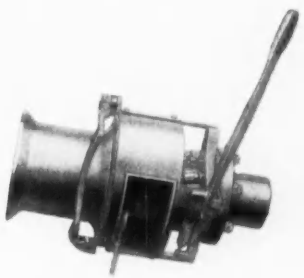
• For more than 25 years we have specialized in the manufacture of Catheads. As a result Foster Catheads provide the best in safety, speed, dependability and economy, whether they be on the shallowest or deepest rigs. There is a Foster Cathead for every need. For longer life and lower maintenance, equip your rigs with Foster Catheads.



FOSTER MIDGET SPINNING CATHEAD
Relieves operator of handling spinning line . . . pipe is spun up smoothly under low clutch pressures . . . plenty of power for tonging. Drum does not crawl when clutch is disengaged.

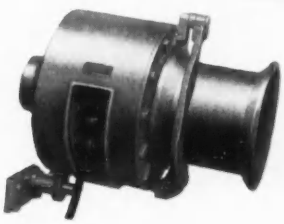


FOSTER MASTER, TYPE 33, BREAKOUT CATHEAD
Instant engagement without reducing lineshaft speed . . . no metal to metal impacts . . . no complicated brake necessary . . . Powerful friction clutch . . . roller bearings . . . Either air or mechanical controls.

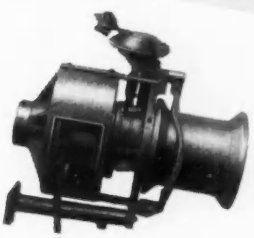


FOSTER SPINNING CATHEAD
Instant engagement without reducing lineshaft speed . . . will spin and tong with forked line . . . Heavy bearings, well lubricated . . . record of years of operation without repairs . . . Eliminates hand wrapping of spinning line.

FOSTER AIR SPINNING CATHEAD
Fully enclosed . . . operator can apply any desired amount of power to the pull line . . . Instant engagement without reducing lineshaft speed . . . 19½" single plate crawl-free friction clutch; recommended for pull up to 12,000 lbs. . . . Smoothness of power makes spinning rope and spinning chain last much longer . . . no adjustments during life of Cathead.



FOSTER AIR MASTER BREAKOUT CATHEAD
Fully enclosed . . . operator in complete control of pull on jerkline at all times . . . Instant engagement without reducing lineshaft speed . . . 16" triple plate crawl-free friction clutch; amply powered and field proved . . . No brakes required and no metal-to-metal impacts . . . no adjustments during life of Cathead.



FOSTER MIDGET MASTER BREAKOUT CATHEAD
Friction clutch and small drum permit instant engagement without reducing lineshaft speed . . . no metal-to-metal impact . . . no brakes required . . . equipped with air or mechanical controls.

Foster CATHEAD COMPANY
P. O. BOX 1675 WICHITA FALLS, TEXAS

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• See the Composite Catalog for complete description of our full line of Catheads.

PERU

Crude Output of 16,109,896 Barrels Sets New Mark; All-Time Total Production Pushed to 418,270,423

WITH crude production of 16,109,896 barrels, Peru established a new record in 1951, pushing its cumulative output to 418,270,423 barrels since the nation began producing oil in 1896. That year production amounted to 47,000 barrels. Daily production at the close of the year averaged 38,877 barrels, as compared to 41,172 barrels at the same time the previous year.

Early in January, 1951, the first of a series of ten wells scheduled to be drilled in an effort to find deeper production in the Zorritos concession was abandoned at 6800 feet. The program was initiated by Empresa Petrolera Fiscal, the government oil agency whose concession area extends from the north boundary of International Petroleum Company, Ltd., producing area. Empresa has approximately 340 barrels daily production from existing shallower wells.

With four refineries currently operating, Peru is building its exchange reserves by a steadily increasing export traffic in both crude and refined petroleum.

REFINERIES OF PERU

Cia. de Petroleo Ganso Azul, Ltda.: 1000-barrel-a-day skimming refinery at Agua Caliente.
Cia. Petrolera Lobitos: 100-barrel daily skimming refinery at Lobitos.
Empresa Petrolera Fiscal: 1200 barrels a day skimming refinery at Villar (Zorritos).
International Petroleum Co., Ltd. (Standard Oil Co. of New Jersey): 30,000 barrels daily complete type refinery at Talara.

PIPE LINES OF PERU

International Petroleum Co. (Esso Standard Oil Co.): 36,000-barrel-a-day crude 160-mile, 2-to-12-inch crude line from La Brea and Lobitos to Talara.
Cia. de Petroleo Ganso Azul, Ltd.: 48-mile, 4-inch crude line from Ganso Azul to Paculpa projected.

Drilling in Peru

DEPARTMENT and FIELD	WELLS COMPLETED IN 1951				Wells Drilling End of 1951	WELLS COMPLETED IN 1950			
			TOTAL					TOTAL	
	Oil	Dry	Wells	Footage		Oil	Dry	Wells	Footage
LORETO:									
Wildcats	..	..	.....	4,000	1		..	.....	.....
PIURA:									
La Brea y Parinas	56	62	118	502,065	9	61	44	105	397,956
Lobitos	22	18	40	186,017	5	20	4	24	125,865
Los Organos	10	2	12	39,157	5	8	..	8	18,226
Restin-El Alto	43	5	48	106,977	9	58	2	60	111,536
TUMBES:									
Wildcats (Zorritos)	..	2	2	4,972	Nil	..	1	1	6,895
Total	131	89	220	843,188	29				

Peru Oil Production and Geological Data

DEPARTMENT and FIELD	Year of Discovery	PRODUCING OIL WELLS END OF 1951			CRUDE OIL PRODUCTION (Barrels)				Proved Area (Acres)	Gravity of Oil (API)	Formation Name and Kind	Geologic Age	DEPTH (Ft.)		Avg. Thickness of Pay (Feet)	Type of Structure
		Flowing	Art. Lift	Total	Daily End of 1951	Year 1950	Year 1951	Cumulative Through 1951					Min. to Top of Pay	Max. to Bottom of Pay		
HUANUCO:																
Agua Caliente[1]	1939	5	1	6	462	149,462	168,656	982,527	1,000	44	Agua Caliente, Ash-bed, Sand	Lower Cretaceous	1090	1300	n.a.	Dome
PIURA:																
La Brea y Parinas[2]	1875	38	2,109	2147[6]	31,159	11,520,912	11,372,907	334,909,217	20,000	35, 38	VerdunTalara, Parinas, Salinas, Sand	Eocene	60	6000	n.a.	Faulted and Folded
Restin-El Alto[3]	.....	1904	27	785	812	1,879,759	n.a.	n.a.	10,000	35-36	L. Caverno, Sand	Upper Eocene	1800	2400	n.a.	Faluted blocks
Lobitos[3]	1901	62	222	284[5]	6,681	1,338,592	2,438,518	77,767,147	5,000	35-36	Terebratula, Sand	Upper Eocene	142	6500	n.a.	Faulted Blocks
Los Organos[4]	1943	....	38	38	520	123,123	189,719	900,842	250	44	Talara, Conglomerate, Lomitos, Sand	Upper Eocene	100	6600	n.a.	Monocline and Faulted Blocks
TUMBES:																
Zorritos-Cope[4]	1865	....	44	44[7]	55	15,991	19,907	3,710,690	1,000	38	Zorritos, Sand	Miocene	1200	1800	n.a.	Monocline and Faluted Blocks
Total	.....	132	3,199	3,331	38,877	15,027,839	16,109,896	418,270,423	37,250							

[1] Compania de Petroleo Ganso Azul Limitada. [2] International Petroleum Company. [3] Compania Petrolera Lobitos. [4] Empresa Petrolera Fiscal. [5] Includes 2 gas wells, one of which is shut in. [6] Includes 7 gas wells, 46 gas injection wells, 12 water injection wells, and 207 temporarily shut in. [7] Of the 44 wells, 33 are regularly producing and 10 are producing intermittently.

VENEZUELA

More Wells Drilled, More Oil Produced, More Exported Than Ever Before; No Slowdown in Sight at Year's End

VENEZUELA had its biggest oil year in 1951. There were more wells drilled, more oil produced, and more oil exported than ever before. And there was no slow-down in sight at year's end.

A substantial increase in production was, of course, the most important result of the accelerated activity. New production records were set in almost each successive month throughout 1951.

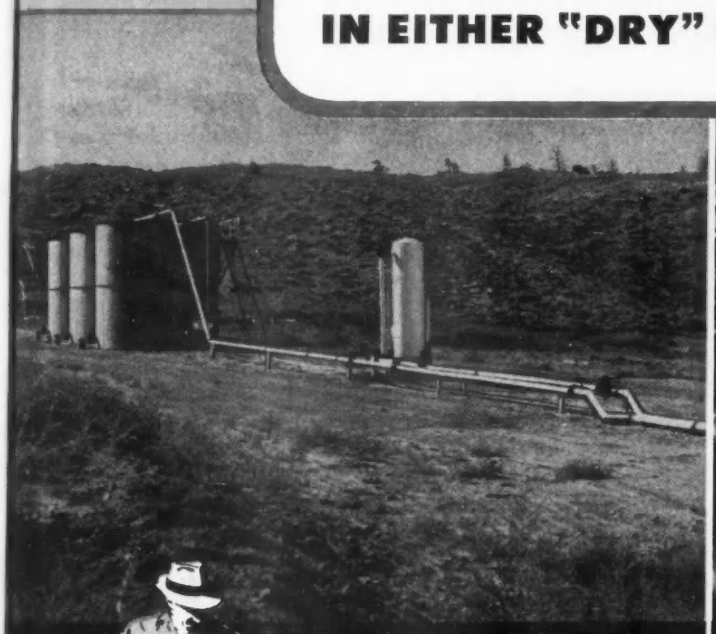
The two largest operating companies, Creole Petroleum Corporation and Shell Caribbean Petroleum Company, both reported increases over 1950 of about 14 percent.

Creole's daily average for the year was 758,025 barrels, compared with 668,184 barrels in 1950. Toward the end of the year, Shell wells were yielding about 580,000 barrels of oil daily, for an all-time peak.

Daily average oil production for the entire country was

BORASCU®
WEED KILLER

GIVES FREEDOM FROM FIRE HAZARD CAUSED BY WEEDS AND GRASSES IN EITHER "DRY" OR "WET" AREAS



Operators of this remote location need have no fear of weed and grass fires.

Rod Lines, kept free of weeds and grasses by Borascu, are easily accessible for inspection and maintenance.

BORASCU is great for reducing labor costs in the battle against fire-hazardous weeds and grasses about all manner of petroleum installations. In oil fields from California to Pennsylvania—from Alberta to Venezuela—economy-minded production men are turning to safe, easy-to-apply Borascu; the most practical solution to their weed and grass maintenance problems. Once tried, Borascu continues to be used consistently by major and independent operators for economy and effectiveness. Users have found that non-corrosive, non-poisonous Borascu reduces the cost of weed problems up to 80% less than the cost of former methods. Application is so easy... just a man, a pail, and Borascu... no special equipment is required. And the results are long-lasting... one correct application can destroy vegetation and prevent future growth for 12 to 24 months, or longer! Borascu Field Men and Distributors are located throughout the oil fields of U.S. and Canada; ask them for details or write to us at once for your copy of our new Borascu Service Bulletin!

LITERATURE AVAILABLE ON REQUEST

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about 1,705,000 barrels, although by December it had risen another 75,000 barrels. By far the greater part of production—70 percent—came from the prolific Maracaibo Basin fields of Western Venezuela.

Oil in Venezuela is found in three sedimentary basins, the Maracaibo, Orinoco and Apure, and cover principally the states of (1) Zulia-Falcon, (2) Guarico-Anzoategui-Monagas-Sucre-Delta Amacuro, and (3) Portuguesa-Barinas-Apure. Combined area is about 62 million acres, of which only about 16 million acres are held in concessions by oil companies.

Venezuela is now believed to have about 10 percent of the world proved reserves. Activity in 1951 increased the estimate to 9,031,000,000 barrels, a boost of 932,800,000 barrels over the 1950 figure.

Once again, Venezuela was the leading oil-exporting nation. When Iran cut off its supply to world markets, the demand for Venezuelan crude leaped. During 1951, exports reached 588,500,000 barrels, consisting of 502,900,000 barrels of crude petroleum and the remainder, or 85,600,000 barrels, of products. These figures compare with total exports of 519,700,000 barrels during 1950, an increase of 11.1 percent.

Drilling operations showed the greatest increase over 1950, especially in Western Venezuela where completions averaged two wells a day. The rush was on in Bachaquero, Lagunillas and Tia Juana fields, where 676 wells were drilled in 1951, compared with only 40 the previous year.

While the northern lake fields accounted for the greater part of the gain, drilling crews were not idle in other western fields. The 1951 increase in number of wells drilled for the entire area was a fabulous 1437 percent, and 45 rigs were running at year's end to keep up the pace.

Largely accounting for the rapid rate of drilling was that the heavy oil producing horizons are relatively shallow, averaging about 3350 feet, and fast well completion times can be achieved.

Exploratory drilling was more effective in Eastern Venezuela than in the western sector, and resulted in discovery of six new fields in 1951, all in the state of Anzoategui. Most significant of these was the Boca field, where 15 successful wells added 854,000 barrels of oil to the country's production. The total number of wells drilled in Eastern Venezuela was up 23 percent in 1951 over the 1950 figure.

New installations increased the capacity of Venezuela's pipe lines by about 170,500 barrels daily. Total length of the system at the end of the year was more than 1500 miles, and capacity was about 3 million barrels.

Two important additions to the crude pipe line system were either under way or being planned in 1951. One was the 150-mile, 30-inch crude line being built from the terminal at Palmarejo, on the western shore of the lake north of Maracaibo City, to the refinery at Cardon. This line is owned 89 percent by Shell, the smaller shares being held by Texas Petroleum Company and Mene Grande Oil Company.

Still in the engineering stage in 1951 was a line to parallel Creole's 143-mile, 26-inch Nuevo Ule to Amuay line. The proposed new line would increase delivery of Lake Maracaibo crude to the terminal and refinery at Amuay from 300,000 to 480,000 barrels a day.

The longest pipe line project under construction in Venezuela was the 170-mile, 10¾-, 12¾-, and 16-inch natural gas system being built by Venezuelan Atlantic Transmission Corporation to supply the Caracas and central region from fields in the northern part of Guarico. This natural gas project is a beginning step in the government's and oil companies' program of conservation and utilization of the abundant supply of the fuel resource. For lack of markets and transportation facilities, about 85 percent of the 675 billion cubic feet total production of gas was wasted in 1951.

In Eastern Venezuela, a program has been carried out for expansion of gas injection and natural gasoline plants. At the end of the year, 11 extraction-injection projects were in operation.

Biggest news in refining was expansion of Shell's refinery at Cardon to a daily capacity of about 165,000 barrels. Work started in 1951 and was scheduled for completion in late 1952.

There was a 26 percent increase in refining operations over 1950, as total refining capacity in the country rose to 326,000 barrels daily in 1951. Throughput for the year amounted to 115,089,876 barrels of crude, approximately 18.5 percent of all the oil produced in Venezuela during 1951.

While no new concessions were granted to operators in 1951 (there have been none since 1946), the Venezuelan government through its generally favorable oil laws continued to encourage the oil industry. The most important single factor in the nation's economy, the petroleum industry contributes an estimated 65 percent of the government's income. In addition to being the most lucrative source of government funds, the industry also supplies approximately 98 percent of the country's requirements for foreign exchange, and gives employment to about 45,000 people.

REFINERIES OF VENEZUELA

British Controlled Oilfields, Ltd. 250-barrel-per-day skimming plant at El Mene de Mauroa.

Creole Petroleum Corporation. 60,000-barrel-per-day skimming plant at Amuay Bay.
65,000-barrel-per-day skimming and cracking plant at Caripito.
40,000-barrel-per-day skimming plant at Jusepin.

Mene Grande Oil Company. 1800-barrel-per-day skimming plant at Cabimas.
20,000-barrel-per-day skimming plant at Mulata.
2200-barrel-per-day skimming plant at Oficina.

Phillips Oil Company. 10,000-barrel-per-day skimming plant at San Roque, under construction.

Shell Caribbean Petroleum Company. 83,000-barrel-per-day cracking plant at Cardon. Facilities for additional 80,000 barrels per day under construction.
44,000-barrel-per-day skimming plant at San Lorenzo.

Sinclair Oil & Refining Company, 35,000-barrel-per-day skimming plant at Puerto La Cruz.

Socony-Vacuum Oil Company. 120-barrel-per-day skimming plant at Guario.

Texas Petroleum Company. 10,000-barrel-per-day skimming plant at Tucupita.

Venezuelan Gulf Refining Company. 30,000-barrel-per-day skimming plant at Puerto La Cruz.

PIPE LINES OF VENEZUELA

British Controlled Oilfields, Ltd., 35 miles of 6-inch crude lines from El Mene to La Estacada, 2500 barrels daily capacity.
8 miles of 4-inch crude line from Hombre Pintado to Media.
4.7 miles of 3-, 4- and 7-inch crude lines from Media to El Mene, 2500 barrels.

Colon Development Company, 25.4 miles of 8-inch crude line from Calvario to La Rivera, 26,400 barrels.
6.3 miles of 8-inch crude line from Casigua to Los Manueles.
26.8 miles of 8-inch crude line from La Rivera to La Solita, 27,000 barrels.
27.5 miles of 8-inch line from Los Manueles to Calvario, 23,900 barrels.

Creole Petroleum Corporation, 7.4 miles of 8- and 10-inch crude lines from Mulata to Travieso, 40,000 barrels.
16 miles of 16-inch crude line from Jusepin to Travieso, 75,000 barrels.
46 miles of 8- and 10-inch crude lines from Jusepin to Caripito, 37,200 barrels.
21 miles of 8- and 10-inch crude lines from Quiriquire to Caripito, 79,400 barrels.

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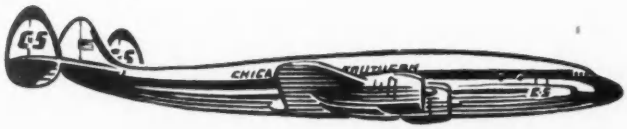

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34 miles of 10-inch crude line from Temblador to Boca de Uracoa, 40,000 barrels.
28.8 miles of 10, 12- and 16-inch crude lines from Punta Gorda to La Salina, 80,000 barrels.
21.3 miles of 10-, 12- and 16-inch crude lines from Rio Ule to Punta Gorda, 40,000 barrels.
140 miles of 24- and 26-inch crude lines from Nuevo Ule to Amuay, 300,000 barrels. Parallel line in planning stage.
14 miles of 24-inch crude lines from Bachaquero to Lagunillas, 100,000 barrels.
2.5 miles of 6-inch crude line from Cumarebo to Tucupido, 15,000 barrels.
4.1 miles of 6- and 12-inch products lines from Los Cocos to Puerto La Cruz, 31,000 barrels.
10 miles of 8-inch products line from Catia La Mar to Caracas, 27,000 barrels.

Eastern Venezuela Gas Transport Company, 63 miles of 16-inch natural gas line from Anaco to Puerto La Cruz, 15 Mmcf daily capacity.

Mene Grande Oil Company, 36 miles of 16-inch crude line from Oficina to Anaco, 228,000 barrels.
3 miles of 8-inch crude line from Chimire to Anaco, 25,200 barrels.
4 miles of 8-inch crude line from Soto Anaco, 12,600 barrels.
60 miles of 16-inch crude line from Anaco to Puerto La Cruz, 230,000 barrels.
95 miles of 16-inch crude line from Travieso to Puerto La Cruz, 96,000 barrels.
11 miles of 8-inch from Pueblo Viejo to Lagunillas, 20,000 barrels.
16.8 miles of 12-inch crude line from Bachaquero to Lagunillas, 25,000 barrels.
2.8 miles of 10-inch crude line from Tasajeras to Lagunillas, 19,900 barrels.
11 miles of 12-inch crude line from Taparito to Cabimas, 30,000 barrels.
4.2 miles of 8-inch crude line from Mara Pus-2 to Est. Texas Creole, 16,000 barrels.
7 miles of 6- and 12-inch crude lines from Mara Pus-1 to Tres Bocas, 4000 barrels.
4.1 miles of 10-inch crude lines from Est. Texas Creole to Tres Bocas, 77,500 barrels.
10 miles of 12-inch crude line from Tres Bocas to Palmarejo.
8.8 miles of 3- and 4-inch line from Netick to La Paz, 1500 barrels.
5.9 miles of 12-inch crude line from Punta Benitez to Cabimas, 10,000 barrels.
.8 mile of 10-inch products loading line, 48,000 barrels.

Phillips Oil Company, 6.6 miles of 6-inch crude line from Mata Grande to Santa Barbara, 12,000 barrels.
5.6 miles of 6-inch crude line from San Roque to Santa Ana, 24,000 barrels.

Richmond Exploration Company, 12 miles of 18-inch crude line from La Villa to Est. Bomba Carretera Perija, 30,000 barrels.
10.6 miles of 18-inch crude line from Carretera to Bajo Grande.
1.6 miles of 18-inch crude line from Bajo Grande to Plataforma de carga, 30,000 barrels.
4.8 miles of 4-inch crude line from Ensenada to Bajo Grande, 700 barrels.

S. A. Petrolera Las Mercedes, 157.7 miles of 16-inch crude line from Guasimito to Pamatacual, 193,500 barrels.

Shell Group, 150 miles of 30-inch crude line from Palmarejo to the refinery at Cardon, 230,000 barrels. Under construction.
13.2 miles of 4- and 6-inch crude lines from La Concepcion to Sibucara, 6900 barrels.
10.3 miles of 12-inch crude line from Sibucara to Palmarejo, 120,000 barrels.
44 miles of 6-, 10- and 12-inch crude lines from La Paz to Palmarejo (via La Concepcion), 66,700 barrels.
45.4 miles of 10- and 12-inch crude lines from La Paz to Palmarejo (via Cuatro Bocas), 104,000 barrels.
18.3 miles of 12-inch crude line from Mara to Palmarejo, 77,000 barrels.
19.4 miles of 8-inch crude line from Mene Grande to San Lorenzo, 53,500 barrels.
12.4 miles of 14-inch crude line from Tia Juana to Cabimas, 56,600 barrels.
9.4 miles of 3-inch products line from San Lorenzo to Mene Grande, 2500 barrels.
24 miles of 4-inch products line from La Paz to Palmarejo, 4500 barrels.
18.3 miles of 4-inch products line from Mara to Palmarejo, 4500 barrels.
16 miles of 3-inch products line from Mara to La Paz, 1000 barrels.

Sinclair Oil & Refining Company, 9.5 miles of 3-, 4- and 8-inch crude lines from Muri to Santa Barbara, 554 barrels.
95 miles of 12-inch crude line from Santa Barbara to El Chaure, 69,750 barrels.
1.2 miles of 12-, 14-, 16- and 18-inch loading lines, 325,000 barrels.

Socony Vacuum Oil Company, 166.5 miles of 12-inch crude line from Guico to Puerto La Cruz, 70,000 barrels.
4.3 miles of 6-inch crude line from Nipa to Puerta La Cruz, 10,000 barrels.

Venezuelan Atlantic Refining Company, 10.7 miles of 8-inch crude line from Ruiz to Saban, 18,000 barrels.
16.4 miles of 8-inch crude line from Saban to Tucupido, 12,000 barrels.
3.7 miles of crude line from Anipa to Santa Barbara, 6000 barrels.
12 miles of 6-inch crude line from Pelayo to Leona, 6000 barrels.
3.2 miles of 6-inch crude line from Taman to Tucupido, 18,000 barrels.
11.3 miles of 8-inch crude line from Tucupido to Las Palmas, 32,000 barrels.

Venezuelan Atlantic Transmission Corporation, 170 and 115 miles of 10¾-, 12¾- and 16-inch natural gas lines from Lechosos to Valencia anr La Guaira, 60 Mmcf.
36 miles of 6-, 8- and 10-inch natural gas lines from Placer to Lechosos, 15 Mmcf.
18 miles of 13-inch natural gas line from Las Mercedes to Lechosos, 20 Mmcf.

Venezuelan Gulf Refining Company, 2.8 miles of 12- and 16-inch loading lines, 100,000 barrels.

Venezuelan Oil Concessions Ltd., 31 miles of 8-inch natural gas line from La Paz to Punta de Piedras, 9 Mmcf daily capacity.
26 miles of 4- and 6-inch natural gas lines from La Paz to Maracaibo, 3 Mmcf.

Drilling in Venezuela

STATE and FIELD	WELLS COMPLETED IN 1950 Oil	Dry	TOTAL Wells	Footage	WELLS COMPLETED IN 1951 Oil	Dry	TOTAL Wells	Footage†	Wells Drilling End of 1951
EASTERN VENEZUELA:									
Anzoátegui:									
Aragua	2		2	17,866					
Boca					15	4	19	226,597	6
Caico Seco		1	1	8,193	4	1	*6	69,675	3
Cerro Pelado					1	1	2	5,905	
Chimire	51		51	376,226	42	5	*48	318,999	1
Dación					34	2	36	228,277	1
El Roble	3		3	1,670	2		2	16,663	
El Tocó					5		5	45,521	1
Esquina					1	1	2	15,443	1
Fría					1		1	6,509	
Guara	14	3	17	100,614	6	1	7	58,225	1
Guario	2		2	10,027	6	1	7	39,842	1
Guico					3		3	18,664	
Inca	2	1	3	7,118					
La Leona	7		7	47,386	13	1	14	97,408	1
La Vieja					5		5	16,643	2
Moriche		1	1	6,324					
Nipa	27	3	30	182,240	13	3	16	140,003	1
Oficina	15	2	*18	99,010	37	5	*43	254,268	2
San Joaquin					5	1	6	32,930	
San Roque	11	1	12	93,201	9		9	92,897	4
Santa Ana	4	1	5	41,292	4		4	34,845	1
Santa Rosa	2		2	9,778	1		1	19,170	1
Soto	3		3	64,934	15	1	*17	193,402	4
Yopales			* 1	4,694					
Guárico:									
Barbacoas	1		1	6,399					
Belén		1	1	12,854		2	2	7,690	
Guavinita	2	3	5	11,037		4	4	12,444	
La Mercedes	31	9	40	238,479	23	10	*34	163,910	3
Mata					1	1	2	46,751	1
Palacio	6	1	7	28,333	2	6	*9	32,090	1
Piragua		2	2	7,173		3	3	11,466	
Ruiz	39	2	41	221,813	17	4	‡23	91,798	
Sabán	2	1	3	8,869	14	13	27	84,101	2
Tamán	11	3	14	64,885					
Tucupido	6	8	*15	54,094	3	6	*10	43,117	
Valle						4	4	17,231	
Monagas:									
Guere					7		7	51,614	2
Jusepín		1	1	10,827		1	1	5,902	
Mulata					4		4	20,656	
Quiriquire	31	3	34	145,173	13	1	14	73,396	2
Santa Bárbara		1	1	2,198				2,746	1
Tonoro								4,340	1
Sucre:									
Guanaco						1	1	11,030	1
Territoria Delta:									
Amacuro:									
Pedernales	4	1	5	42,027	5	1	6	44,649	1
Total Wildcats, Eastern	5	8	*14	102,007	5	12	*18	159,478	7
Total Eastern	281	57	342	2,026,741	316	96	422	2,816,295	53
WESTERN VENEZUELA:									
Falcón:									
Cumarebo					2		2	7,020	
Hombre Pintado					1	2	3	9,649	
Zulia:									
Amana						1	1	n.a.	
Bachaquero	23		23	65,075	347	13	360	1,124,912	9
Boscan-Albaricos	1		1	7,311	12	3	15	120,236	1
Cabimas					1		1	2,109	
Conquistado						1	1	4,658	
El Cubo-West Tara-Las Cruces-Los Manueles					3		3	26,830	3
La Concepción								23,464	2
Lagunillas	4		4	11,539	189	8	197	502,083	3
La Paz	1		1	13,146	10	2	12	126,046	4
Mara					11	3	14	187,477	10
Mene Grande	3		3	11,588	32		32	121,174	2
Punta Benitez					13	1	14	58,156	1
Quirgz					1	4	5	12,086	
Sibucara								25,115	3
Tía Juana	13		13	24,331	118	1	119	226,292	6
Total Wildcats, Western		6	6	69,367		5	5	39,078	1
Western Total	45	6	51	202,357	740	44	784	2,616,385	45
TOTAL VENEZUELA	326	63	393	2,229,098	1,056	140	1,206	5,432,680	98

† Includes footage drilled in wells not completed at end of year. n.a.—Not available. * Includes 1 gas well. ‡ Includes 2 gas wells.

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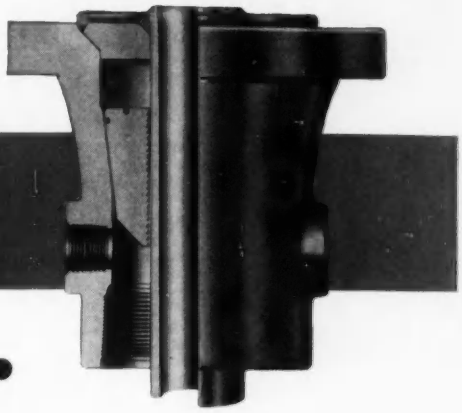

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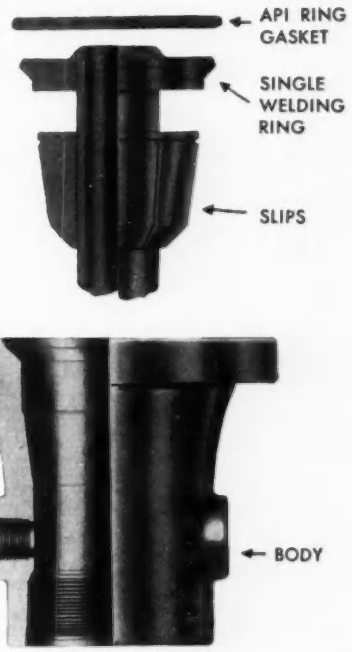
Just set slips, cut off pipe, weld ring to pipe and seal is completed by API ring gasket when blowout preventer, subsequent head or other equipment is bolted in place.

NO RESILIENT PACKING
Rectorheads have no complex packing and slip arrangement. You are not dependent on soft packings to hold the important seal between strings of pipe.

NO BULKY WELDING FLANGE
The welding ring fits into a ground seat in the Rector head body. Pipe is cut off practically flush with welding ring. Blowout preventer, or subsequent equipment is flanged directly on the head body.

PROTECTOR RING
When drilling operations are carried on through the head this ring, furnished with every casing head, protects the slip and welding ring seating surfaces in the body from being damaged by drilling tools.



• Notice how slips, welding ring and API ring gasket are easily installed in the RECTORHEAD Casing Head. All blowout preventers, valves, flanges, spools and tubing heads of API specifications will bolt directly to all RECTORHEADS.

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Oil Production and Producing Wells in Venezuela

STATE and FIELD	OPERATING COMPANY	Year of Discovery	PRODUCING OIL WELLS END 1951			CRUDE OIL PRODUCTION (Barrels)		
			Flowing	Art. Lift	Total	Year 1950	Year 1951	Cumulative Through 1951
EASTERN FIELDS:								
Anzoátegui:								
Apamate	Mene Grande Oil Company	1951	1		1		56,000	56,000
Añaco	Socony-Vacuum Oil Company	1941				1,082		15,000
Boca	Mene Grande Oil Company, Socony-Vacuum Oil Company	1951	11		11		854,000	854,000
Caico Seco	Mene Grande Oil Company	1946	4		4	284,002	244,177	1,191,000
Capacho	Creole Petroleum Corporation	1945						7,000
Cerro Pelado	Mene Grande Oil Company	1951	1		1		14,700	14,700
Chimire	Mene Grande Oil Company, Socony Vacuum Oil Company	1948	123		123	15,150,420	21,469,000	43,257,000
Chive	Mene Grande Oil Company	1951	2		2		190,000	190,000
Dación	Mene Grande Oil Company	1950	44	1	45	1,528,000	4,678,992	6,207,000
El Roble	Creole Oil Company, Pantepec Oil Company	1939	26		26	1,952,109	1,694,706	20,825,000
El Tocó	Mene Grande Oil Company	1948	9		9	631,676	901,000	2,662,000
Esquina	Socony-Vacuum Oil Company	1951	2		2		1,440	1,440
Freites	Creole Petroleum Corporation	1949				1,025		15,000
Fria	Mene Grande Oil Company	1947	2	1	3	284,669	241,370	1,220,000
Guara	Mene Grande Oil Company	1941	153	49	202	21,085,217	19,933,000	173,633,000
Guario	Socony-Vacuum Oil Company	1940	21	2	23	1,803,701	2,256,000	15,653,000
Guere	Sinclair Oil & Refining Company	1950	6		6		749,482	749,482
Guico	Socony-Vacuum Oil Company	1944	35	19	54	3,939,969	4,124,000	33,233,000
Inca	Mene Grande Oil Company	1948	2		2	148,709	137,952	321,000
La Ceiba	Mene Grande Oil Company	1946				24,547		255,800
La Vieja	Mene Grande Oil Company	1950	4		4	804	71,010	71,814
Leona	Mene Grande Oil Company	1938	24	10	34	1,818,583	2,512,898	14,937,000
Los Mangos	Mene Grande Oil Company	1950	1		1		101,372	101,372
Mata	Texas Petroleum Company	1951	2		2		1,925	1,925
Mapire	Mene Grande Oil Company, Socony-Vacuum Oil Company	1950	20	1	21	848,000	3,303,000	4,151,000
Merey (Areo)	Mene Grande Oil Company	1934	2	1	3	96,460	205,534	606,000
Nipa	Mene Grande Oil Company, Socony-Vacuum Oil Company	1945	120	6	126	14,029,788	14,161,000	53,840,000
Oficina	Mene Grande Oil Company	1937	138	133	271	15,503,440	21,377,000	190,241,000
Pelayo	Venezuelan Atlantic Refining Company	1947	1		1	45,865	7,000	243,000
Quiamare	Mene Grande Oil Company	1942				6,661		703,000
Rincón Largo	Texas Petroleum Company	1941	4		4	585,685	582,175	4,968,000
San Joaquin	Creole Petroleum Corporation	1939	38	2	40	3,176,597	2,965,489	35,384,000
San Roque	Phillips Oil Company	1949	29		29	2,199,146	1,698,000	5,006,000
Santa Ana	Mene Grande Oil Company	1936	17		17	1,286,348	1,770,957	5,591,000
Santa Rosa	Mene Grande Oil Company	1941	13		13	1,476,457	1,388,502	8,686,000
Tagua	Mene Grande Oil Company	1950	1		1		22,818	22,818
Soto, E.	Mene Grande Oil Company	1951	5		5		308,000	308,000
Yopales	Mene Grande Oil Company	1937	11	9	20	847,787	1,210,717	4,845,000
Guárico:								
Barbacoas	Venezuelan Atlantic Refining Company	1950	1		1		296	296
Las Mercedes, Guavinta, Palacio	S. A. Petrolera Las Mercedes	1941	171	29	200	6,827,512	8,459,430	23,610,000
Ruiz	Venezuelan Atlantic, S. A. P.	1949	58	9	67	2,129,770	3,380,647	5,692,000
Saban	Venezuelan Atlantic Refining Company	1947	9	6	15	73,138	225,186	424,500
Taman, Tucupido	Venezuelan Atlantic Refining Company	1946	42	10	52	5,394,669	3,296,878	13,585,000
Piragua	S. A. Petrolera Las Mercedes	1949	2		2		2,000	2,000
Monagas:								
Jusepin	Creole Petroleum Corporation	1938	144	61	205	8,849,846	7,129,468	135,085,000
Mata Grande	Phillips Oil Company	1946	9	9	18	535,493	627,039	2,634,000
Mulata	Creole Petroleum Corporation, Pantepec Oil Company	1941	87	72	159	7,723,385	5,518,823	64,163,000
Pirital	Venezuelan Atlantic Refining Company	1944				1,032		89,000
Pilon	Creole Petroleum Corporation	1937	4		4		13,875	13,875
Quiriquire	Creole Petroleum Corporation	1928	4	423	427	23,468,628	28,230,690	377,114,000
Santa Barbara	Sinclair Oil & Refining Company, Mene Grande Oil Company		130	120	250	6,174,084	6,031,000	86,625,000
Temblador	Creole Petroleum Corporation	1936	82		82	3,430,521	3,113,420	38,485,000
Sucre:								
Guanoco	Texas Petroleum Company	1914						1,858,000
Territoro Delta Amacuro:								
Pedernales	Creole Petroleum Corporation	1935	17		17	3,555,204	4,298,165	20,398,000
Tucupita	Texas Petroleum Company	1945	42		42	2,715,216	3,586,459	12,557,000
Eastern Totals			1,674	973	2,647	159,635,245	183,146,502	1,413,303,022
WESTERN FIELDS:								
Falcon:								
Alturitas	Creole Petroleum Corporation	1950					9,000	9,000
Cumarebo	Creole Petroleum Corporation	1931	13	40	53	1,260,000	1,334,486	43,700,000
El Mene	British Controlled Oilfields, Ltd.	1921		24	24	148,810	136,000	23,840,000
Hombre Pintado	British Controlled Oilfields, Ltd.	1929	1	26	27	214,324	195,172	4,910,000
Las Palmas	Creole Petroleum Corporation	1928				shut in		381,000
Media	British Controlled Oilfields, Ltd.	1929		2	2		15,000	2,649,000
Mene de Acosta	Tecuyo Oilfields, Ltd.	1927				shut in		790,000
Urumaco	Richmond Exploration Company	1937				shut in		1,289,841
Zulia:								
North Lake Fields	Creole Petroleum Corporation, Shell Venezuelan Oil Concessions, Ltd., Mene Grande Oil Company	1917				28,755,000	31,624,000	671,186,000
Tia Juana		1928	1,413	3,053	4,466	57,404,000	73,202,000	727,062,000
Lagunillas		1926				141,182,000	151,299,000	2,073,538,000
Bachaquero		1938				43,335,000	65,790,000	276,028,000
Boscan	Richmond Exploration Company	1946		25	25	4,534,044	4,802,278	10,854,395
El Cubo, Las Cruces, Tarra, W. Tarra, Manueles	Colon Development Company	1916	21	107	128	4,584,349	4,899,199	123,182,000
El Menito	Mene Grande Oil Company	1924				shut in		7,000
Ensenada	Richmond Exploration Company	1946		1	1	29,034	121,732	180,000
La Concepcion	Shell Caribbean Petroleum Company	1925	1	69	70	1,399,143	1,136,238	36,361,000
La Paz	Shell Caribbean Petroleum Company	1925	27	34	61	57,056,444	58,057,000	270,048,000

■ CONTINUED ON PAGE 164

drilling fluid need

Operators find, in **BAROID DRILLING MUD PRODUCTS,** a complete line of mud-making and mud-treating materials – high-colloidal content clays, organic colloids, salt-resistant mud products, weight material, mud thinners, treating agents and lost circulation additions – all of the high quality for which Baroid has always been noted in every oil field.

The skilled **BAROID FIELD SERVICE ENGINEER** is a familiar figure in every active drilling area in the United States. Thoroughly trained in drilling problems and drilling fluids, these experienced mud engineers are on the job 24 hours a day and 7 days a week, if need be, helping operators to make hole faster, more safely, and more economically, through drilling fluid control.

Where wells are hard to reach, **BAROID FLYING MUD ENGINEER SERVICE** quickly brings the services of the mud engineer to even the most inaccessible wells. Rigs in bayous miles from any road, rigs in isolated country – all are reached within minutes, almost, by a unit of the Baroid air fleet of six planes. Three of these are amphibians which can, practically speaking, go anywhere.

Precision-built **BAROID MUD TESTING EQUIPMENT** is used in every major oil area throughout the world. For every test on drilling fluid, Baroid provides equipment to make the test with the greatest accuracy, ease and speed that is possible. Many of these items of mud testing equipment were invented, developed and designed by Baroid; all are made to the highest standards of Baroid quality.

Providing down-hole information while drilling, **BAROID WELL LOGGING SERVICE** gives operators greater control than was ever known before in the drilling of wildcat or semi-wildcat wells. Examination of the mud and cuttings in the return circulation gives quick and accurate formation data while the bit is drilling. Many operators drilling in known fields also use Baroid Well Logging Service because of its speed and accuracy, and because it also provides core analysis on location.

First in the field, **BAROID RESEARCH LABORATORIES** are still the foremost laboratories devoted to research in the field of drilling fluids. In these laboratories, today as for years past, work goes steadily on, searching for new drilling fluid materials, testing materials, developing new fluids and new techniques for the improvement of well control by drilling fluids.

Completely equipped, **BAROID MOBILE MUD LABORATORIES** are literally laboratories on wheels. Designed to meet those exceptional circumstances which demand the accuracy and completeness of full laboratory service, and at the same time allow a minimum of time, Baroid Mobile Mud Laboratories bring the latest in scientific mud-testing procedures right to the well.

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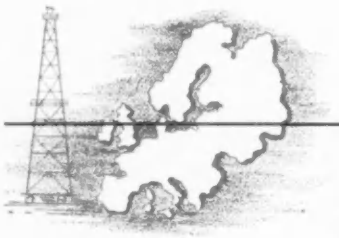
VENEZUELA—Continued

Oil Production and Producing Wells in Venezuela

• CONTINUED FROM PAGE 160

STATE and FIELD	OPERATING COMPANY	Year of Discovery	PRODUCING OIL WELLS END 1951			CRUDE OIL PRODUCTION (Barrels)		
			Flowing	Art. Lift	Total	Year 1950	Year 1951	Cumulative Through 1951
Macoa	Richmond Exploration Company	1949	....	....	....	shut in	....	14,000
Mara	Creole Petroleum Corporation, Shell Caribbean Petroleum Company, Mene Grande Oil Company, Texas Petroleum Company	1945	25	5	30	28,783,404	27,073,000	112,534,000
Mene Grande	Shell Caribbean Oil Company	1914	4	363	367	16,774,403	16,708,564	372,995,000
Netick	Mene Grande Oil Company	1929	....	....	....	12,183	shut in	734,000
San Jose	Richmond Exploration Company	1948	....	....	....	shut in	....	7,000
Sibucara	Shell Caribbean Petroleum Company	1948	1	....	1	3,236,142	2,638,000	8,327,000
Totumo	Creole Petroleum Corporation	1915	....	....	....	shut in	....	149,000
Western Totals		....	1,506	3,749	5,255	388,708,289	439,040,669	4,760,775,236
TOTAL VENEZUELA			3,180	4,722	7,902	548,343,525	622,187,171	6,174,078,258*

* Includes production from abandoned fields not listed.



AUSTRIA

Total 1951 Production Estimated at 15,010,000 Barrels; Russians Test New Fields in Area South of Danube River

THE year 1951 brought about an increase in Austria's oil supply. Total output is estimated at 15,010,000 barrels.

New fields were tested by the Soviets in the area south of the Danube River, between Schwadorf and Enzersdorf. Matzen oil field, discovered by the Soviets two years ago, rose in importance, delivering about half of the Austrian total production. Together with the Matzen field, Aderklaa field boosted its yield, while the Ruppersfeld, Maustrenchk, and Scharfeneck fields decreased in volume.

Austria has about 900 wells. No gas fields exist.

Monetary loss from oil shipped out of Austria by the Soviet Mineral Oil Administration was estimated at $150 million dollars for the period from the second half of 1945 to the end of 1951.

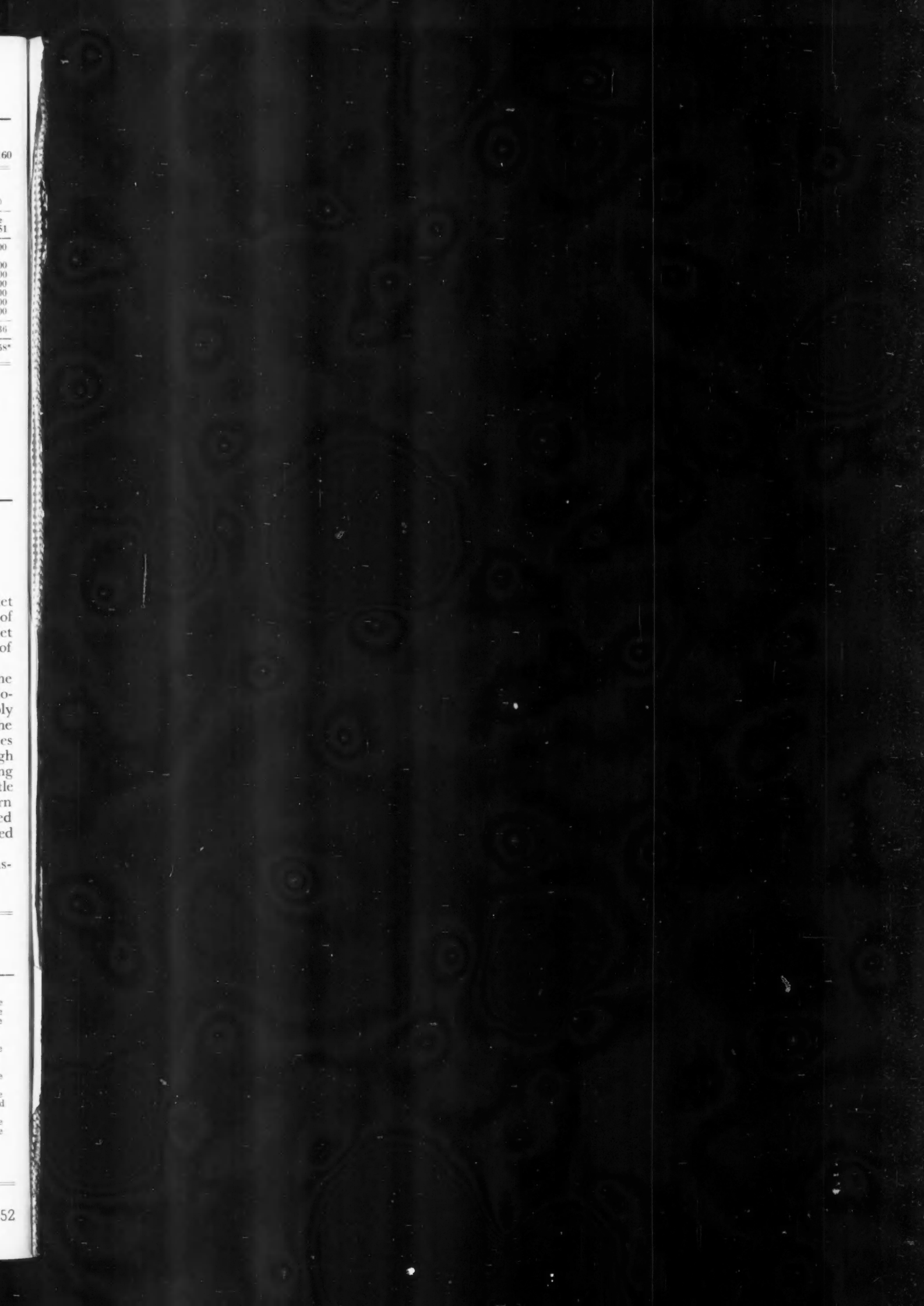
Approximately 25 percent of Austrian crude is shipped out of the country, primarily to the Czechoslovakian People's Republic. About 35 to 40 percent is given to the Austrians and the remainder is refined for Soviet use only. Soviet use includes not only the fulfillment of the requirements for the Soviet army and other Soviet installations presently in Austria, but also the exports of refined oil to the East.

Soviets operate five refineries in Austria, while the Anglo-American group has two in operation. The Anglo-American companies which own a refinery must apply to the SMOA for allocations of crude oil, and the Soviets determine how much oil the refinery receives and from what field. Mostly, refineries receive enough crude to keep the plants at work. Nevertheless, refining is a loss from the financial angle, for Soviets pay little for the crude oil, but sell it at high prices to the Western refineries, keeping the repurchasing price of the refined products low. All refined products have to be turned in to the SMOA.

The Soviets allocate oil and oil products to the Aus-

Engineering and Geological Data on Austria Fields

REGION and FIELD	Proved Area (Acres)	Range of Gravity (API)	Name	Kind	Age	DEPTH (Feet)		Average Thickness of Pay (Feet)	Type of Structure
						Minimum to Top of Pay	Maximum to Bottom of Pay		
LOWER DANUBE:									
Aderklaa	....	48.8-gas	Helvet-Schlier	Sand	Miocene	7977	8535	85	Buried Hill
Alt.-Lichtenwarth	....	Gas	Sarmat-Torton	Sand	Miocene	2886	3644	115	Fault structure
Gaiselberg	200	21.5-27.5	Sarmat-Torton	Sand	Miocene	2066	7724	387	Fault structure
Hohenruppersdorf	....	35.0	Sarmat-Torton (Flysch)	Sand, Sandstone	Miocene (Cret.)	3323	5366	98	Fault structure
Matzen	....	23.8	Sarmat	Sand	Miocene	n.a.	n.a.	n.a.	Anticline
Maustrenk	200	26.5	Helvet-Schlier (Flysch))	Sand, Sandstone	Miocene (Eoc.)	2756	3397	164	Stratigr. trap
Mühlberg	....	30.5	Pannon, Sarmat-Torton	Sand	Miocene	1490	5315	476	Fault structure
Neusiedl	....	31.5	Flysch	Sandstone	Eocene	4003	4101	20	Anticline
Oberlaa	....	Gas	Torton	Sand-conglomerate	Miocene	820	873	13	Buried Hill
Plattwald	....	21.5	Torton	Sand	Miocene	3255	5190	56	Fault structure
Scharfeneck	....	24.0	Helvet-Schlier	Sand	Miocene	3251	3317	66	Stratigr. trap
St. Marx	....	Gas	Torton	Sand	Miocene	2343	2395	52	Fault Anticline
St. Ulrich-Hauskirchen	2000	31.5	Helvet-Schlier (Flysch))	Sand, Sandstone	Miocene, (Eoc.)	2723	3773	394	Buried Hill and Anticline
Van Sickle	....	21.5-27.5	Sarmat-Torton	Sand	Miocene	1312	4593	459	Fault structure
Zistersdorf	100	20.7-27.5	Sarmat, Torton, Flysch	Sand, Sandstone	Miocene	2165	7720	518	Fault structure
UPPER DANUBE:									
Leoprechting	....	12.9	Burdigal-Schlier	Sand	Miocene	394	472	33	Stratigr. trap
Wels	....	Gas	Burdigal, Helvet-Schlier	Sand	Miocene	476	1499	33	Stratigr. trap



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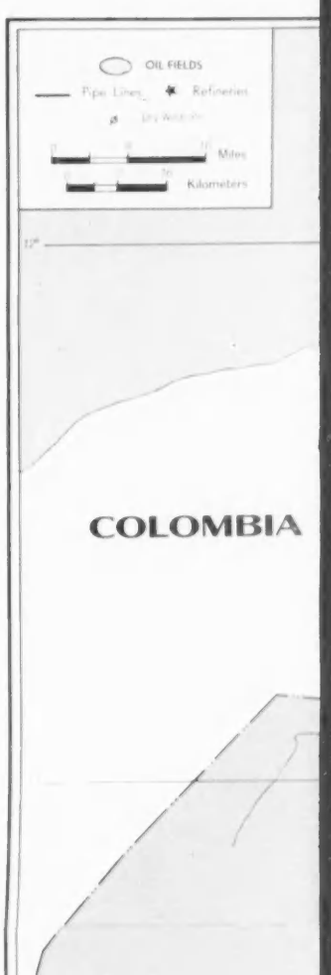
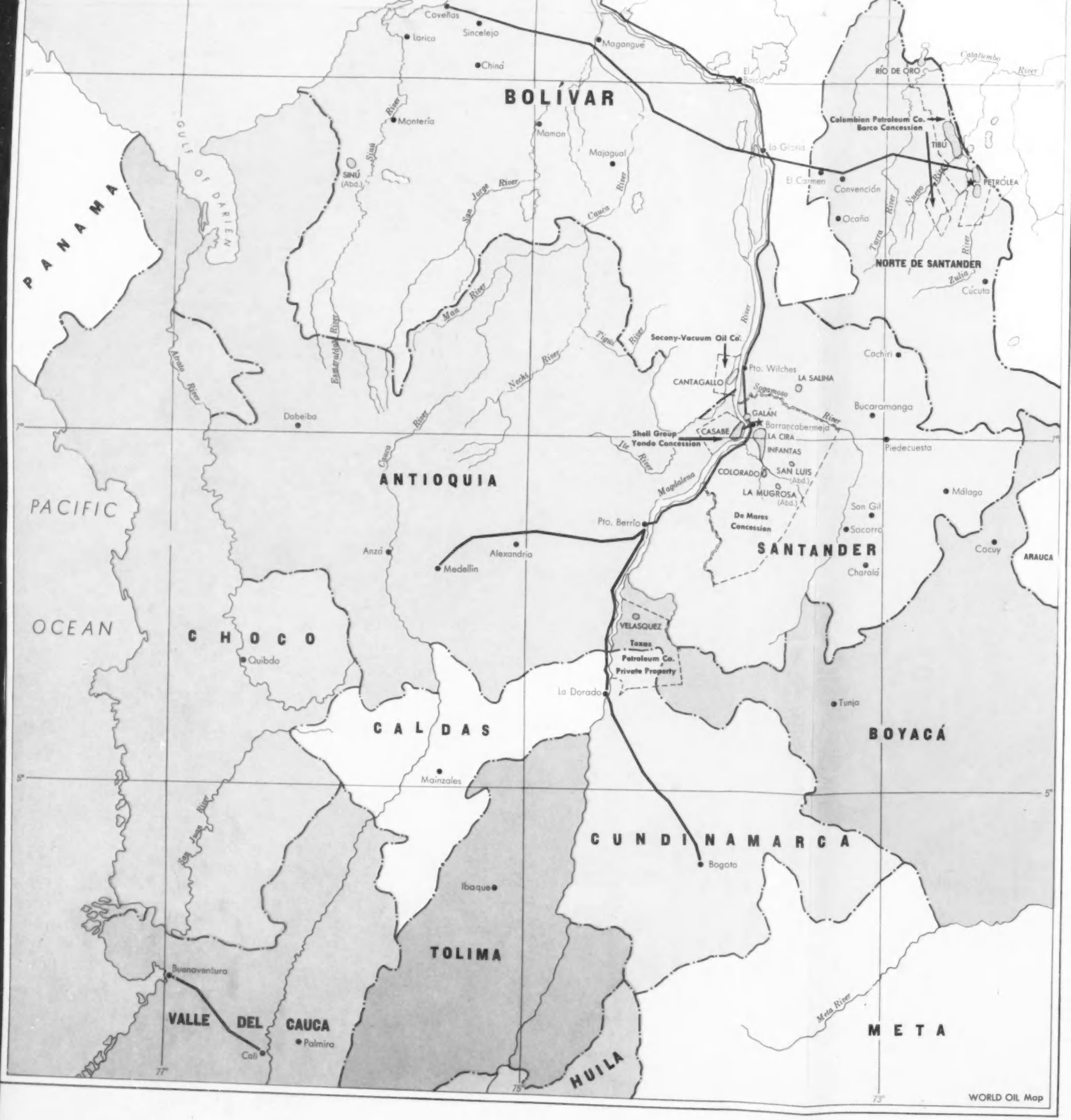
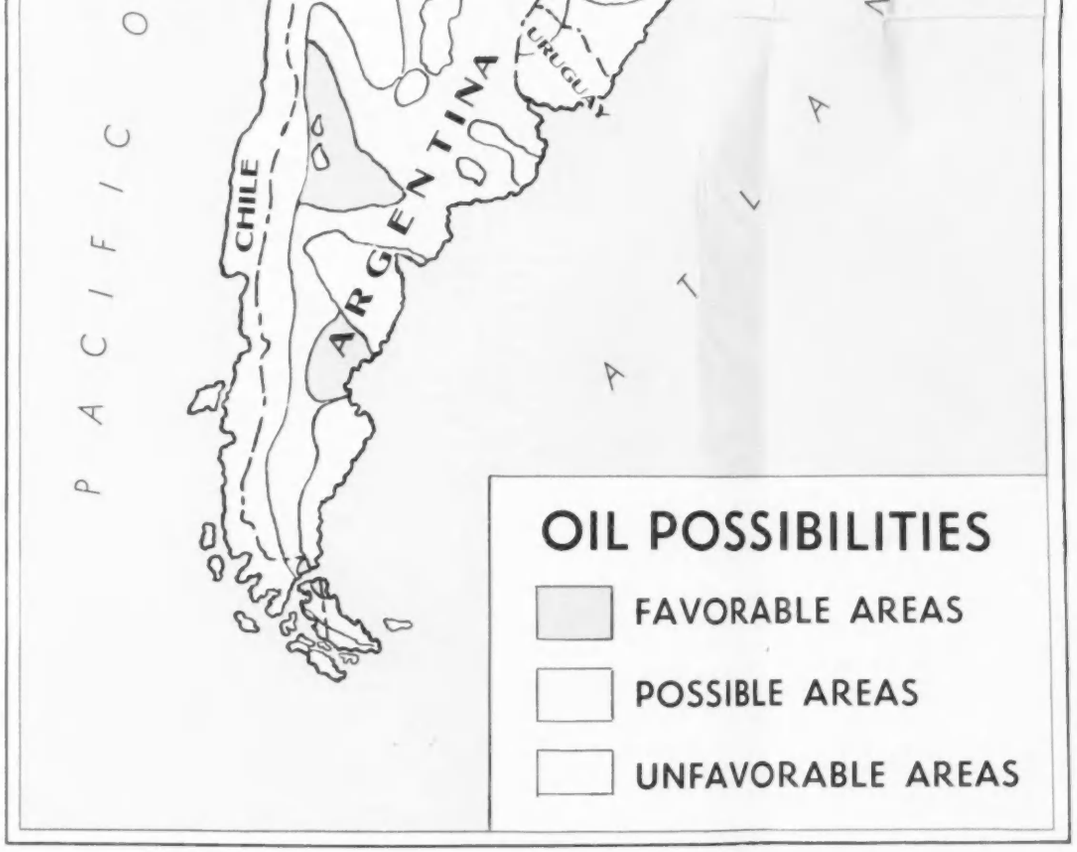
SOUTH AMERICA




Coveñas
Sincelejo
Lorica
Magangué
Chinú
BOLÍVAR
Montería
Mamon
Majagual
SINÚ (Abd.)
Sinú River
San Jorge River
Cauca River
Mata River
Nechí River
Tigui River
Barco Concession
Colombian Petroleum Co.
La Gloria
TIBÚ
El Carmen
Convención
PETROLEA
Ocaña
Catatumbo River
RÍO DE ORO
Zulia River
Tarra River
Mueno River
NORTE DE SANTANDER
Cúcuta
PANAMA
GULF OF DARIEN
Atrato River
Esmeraldas River
Dabeiba
Socony-Vacuum Oil Co.
Pto. Wilches
CANTAGALLO
LA SALINA
Cachiri
Sogamoso River
Bucaramanga
GALÁN
Barrancabermeja
CASABE
LA CIRA
INFANTAS
Shell Group
Yondo Concession
Ité River
Piedecuesta
COLORADO
SAN LUIS (Abd.)
LA MUGROSA (Abd.)
Málaga
ANTIOQUIA
Magdalena River
PACIFIC
Pto. Berrío
De Mares Concession
San Gil
Socorro
SANTANDER
Cocuy
ARAUCA
Charalá
Anzá
Alexandria
Medellín
OCEAN
VELASQUEZ
Texas Petroleum Co. Private Property
CHOCO
Quibdo
La Dorado
Tunja
CALDAS
BOYACÁ
Manizales
CUNDINAMARCA
Bogotá
Ibaque
TOLIMA
Buenaventura
VALLE DEL CAUCA
Palmira
Cali
HUILA
Meta River
META
77°
75°
73°
WORLD OIL Map

BOLIVIA



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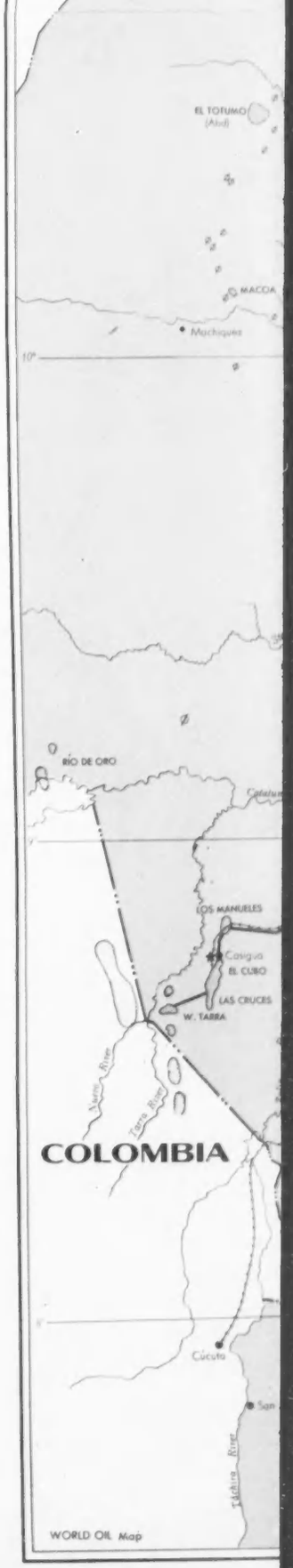

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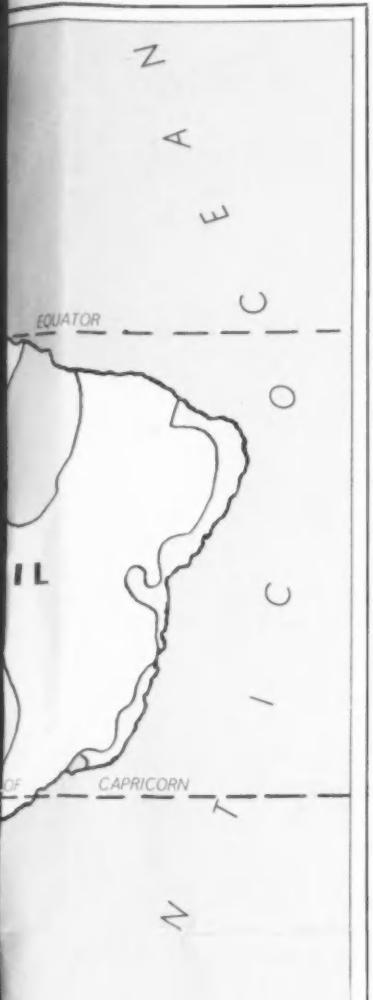

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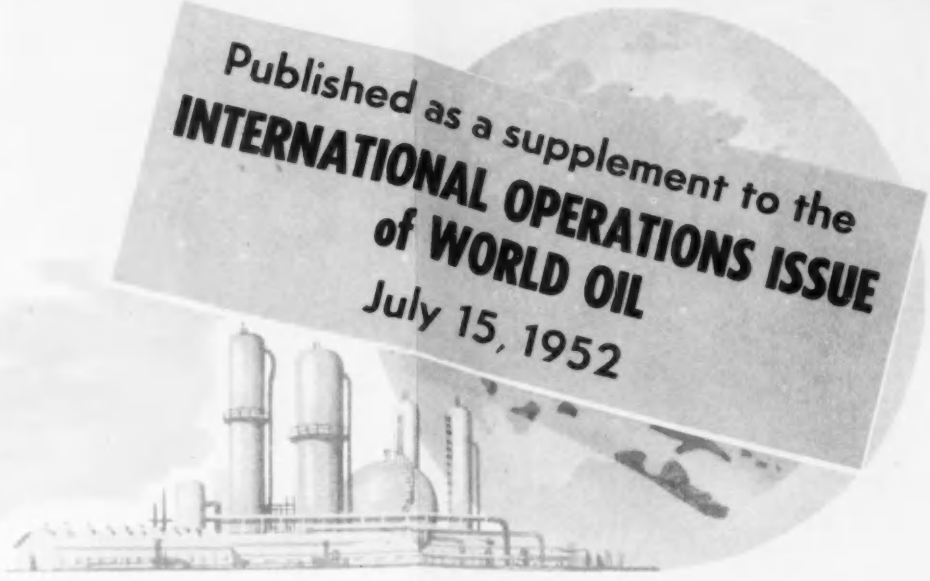
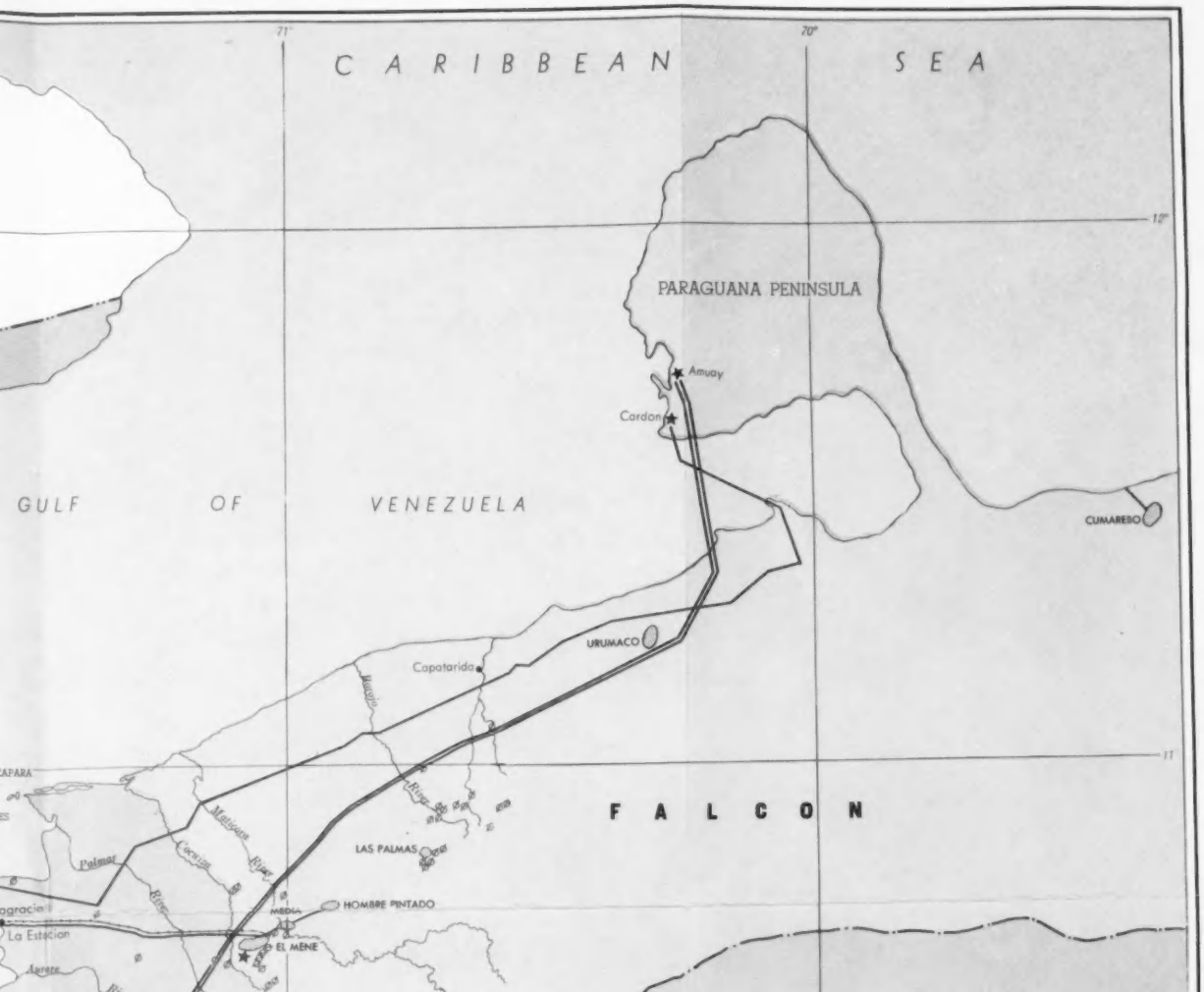
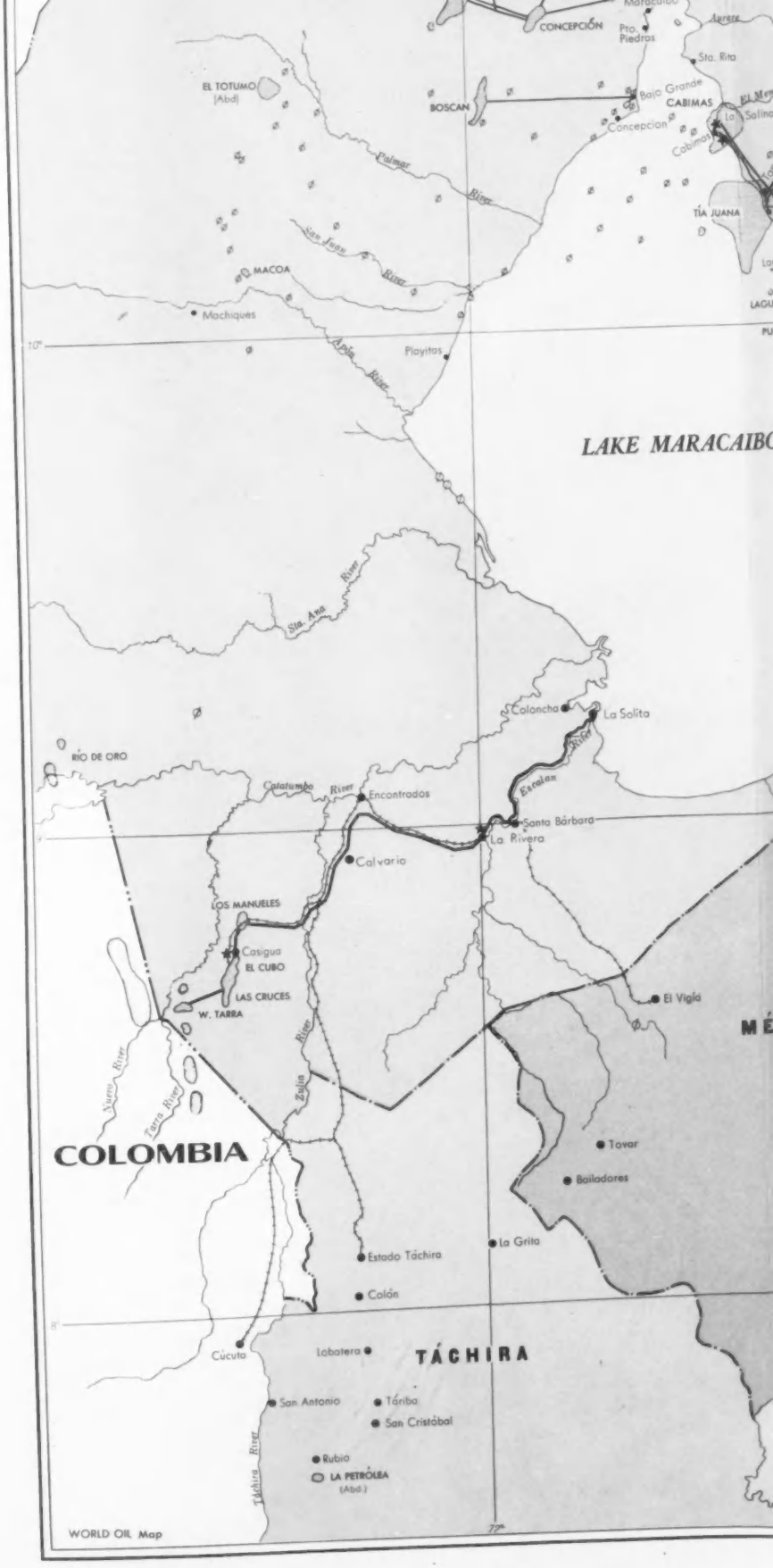


UELA—Western Fields





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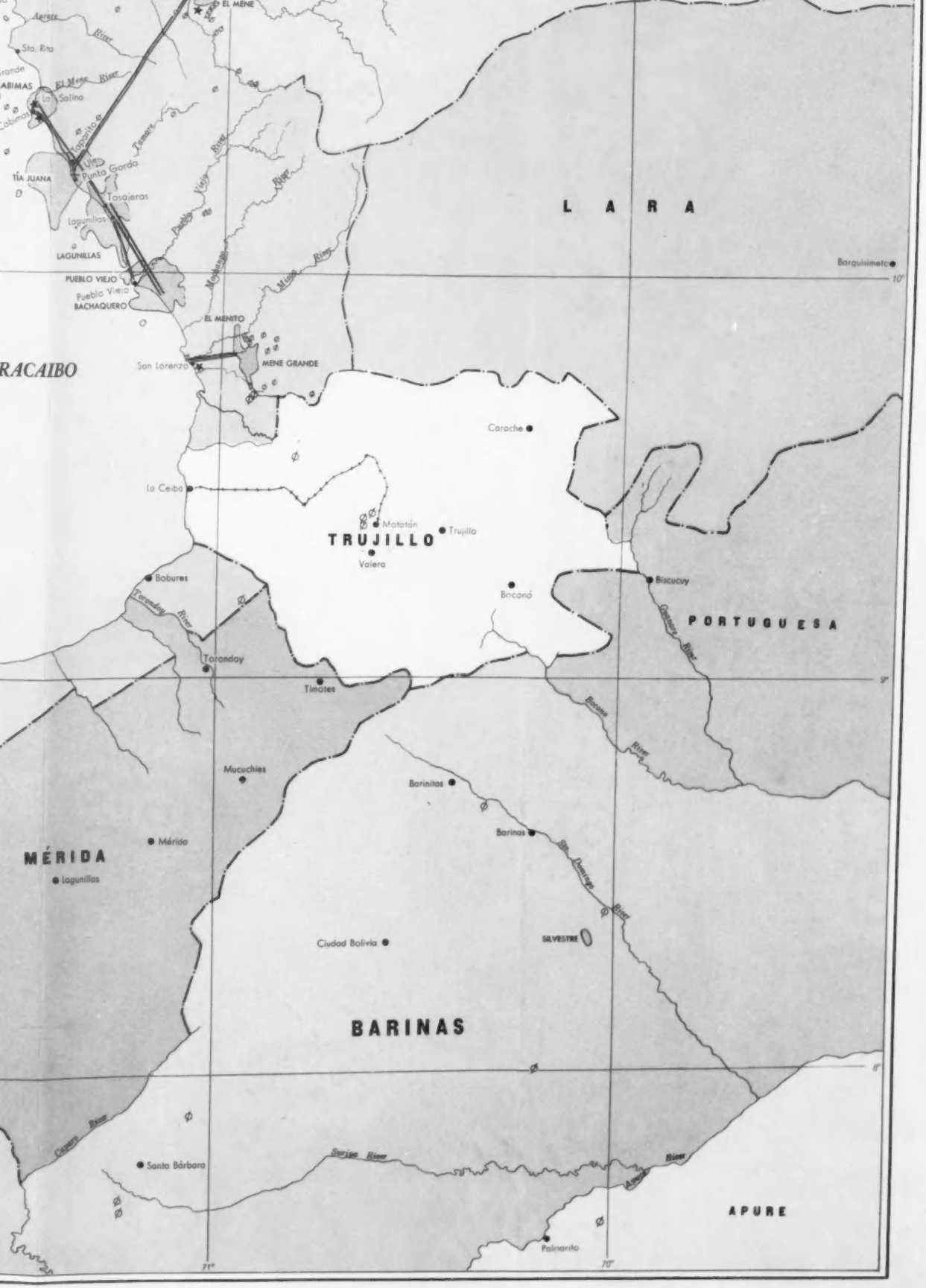
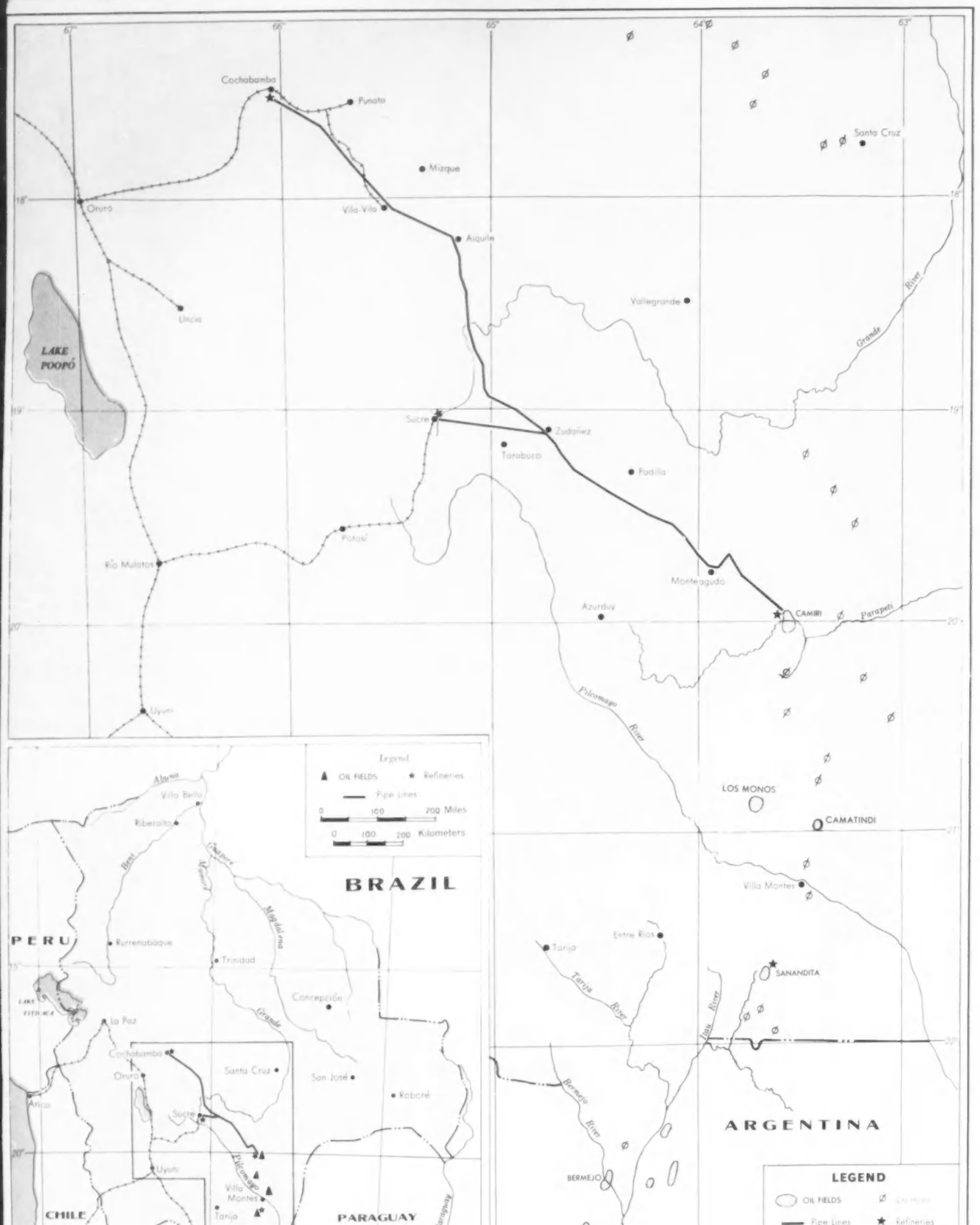
VENEZUELA—Central and Eastern Fi


EL MENE
Sta. Rita
El Mene River
La Salina
Punta Gorda
TIA JUANA
Tasajeras
Lagunillas
LAGUNILLAS
PUEBLO VIEJO
Pueblo Viejo
BACHAQUERO
EL MENITO
MENE GRANDE
San Lorenzo
RACAIBO
L A R A
Barquisimeto
10°
Carache
La Ceiba
Motatán
Trujillo
TRUJILLO
Valera
Boconó
Biscucuy
PORTUGUESA
Bobures
Torondoy River
Torondoy
Timotes
9°
Mucuchies
Barinitas
Barinas
Mérida
MÉRIDA
Lagunillas
Ciudad Bolivia
SILVESTRE
BARINAS
8°
Santa Bárbara
APURE
Palmarito
71°
70°

Fields

BOLIVIA


Cochabamba
Punata
Santa Cruz
Mizque
Oruro
Vila-Vila
Aiquile
Vallegrande
Lincia
LAKE POOPÓ
Grande River
Sucre
Zudañez
Tarabuco
Padilla
Potosí
Río Mulatos
Monteagudo
Azurduy
CAMIRI
Parapeti
Uyuni
Pilcomayo River
LOS MONOS
CAMATINDI
Villa Montes
Tarija
Entre Ríos
SANANDITA
Tarija River
Itau River
Bermejo River
BERMEJO
ARGENTINA
BRAZIL
PERU
CHILE
PARAGUAY
Villa Bella
Riberalta
Rurrenabaque
Trinidad
Concepción
La Paz
Cochabamba
Oruro
Santa Cruz
San José
Roboré
Arica
Sucre
Uyuni
Villa Montes
Tarija
Pilcomayo
Grande
Paraguay
Legend
OIL FIELDS
Refineries
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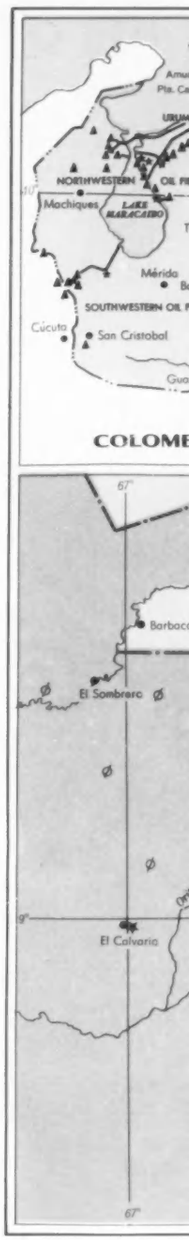
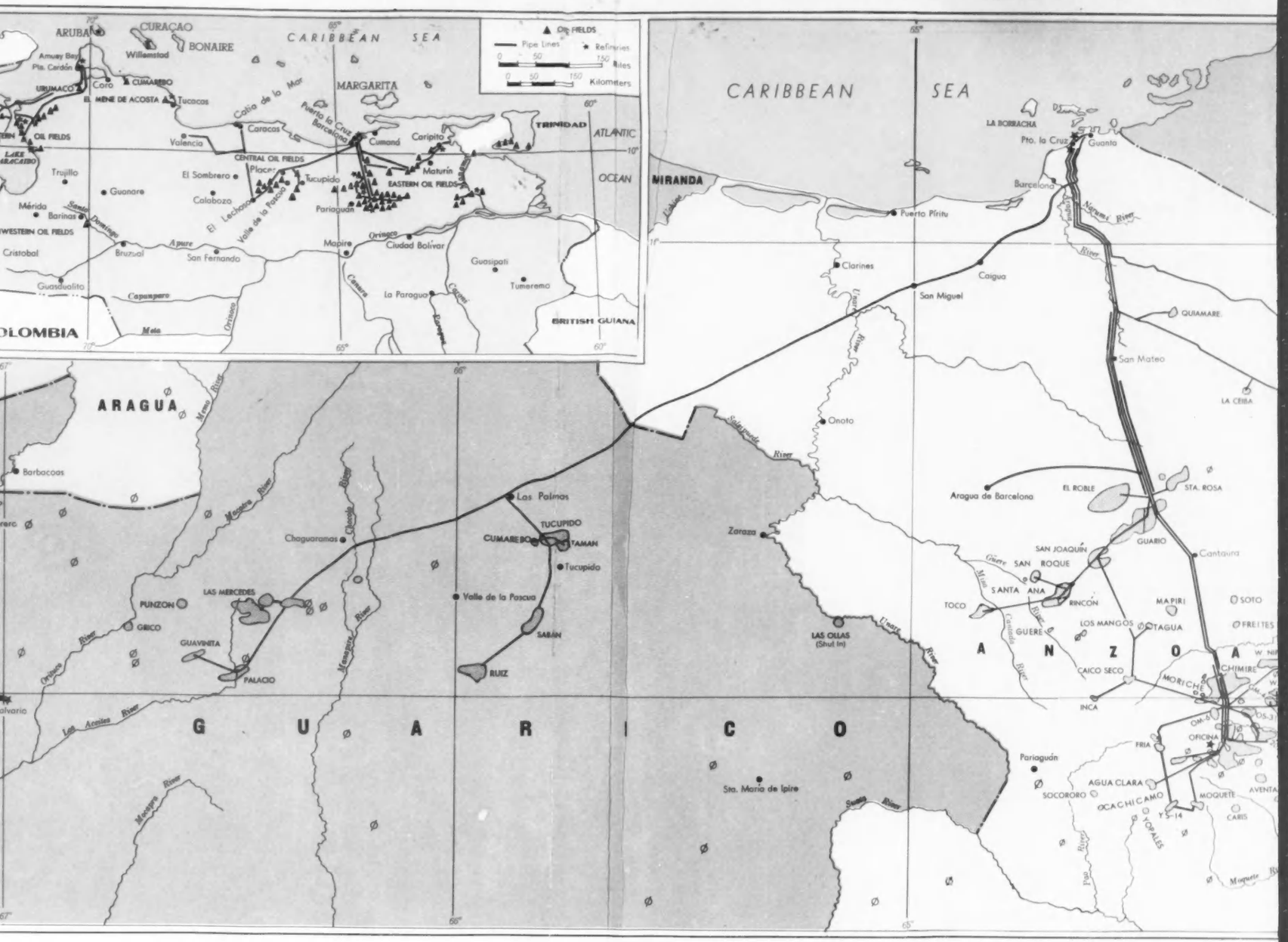
Dry Holes
Pipe Lines
Refineries


NORTHWESTERN
Machiques
LAKE MARACAIBO
Mérida
SOUTHWESTERN OIL
Cúcuta
San Cristobal
COLOME
Barbacoa
El Sombrero
El Calvario

VENEZUELA–Central and



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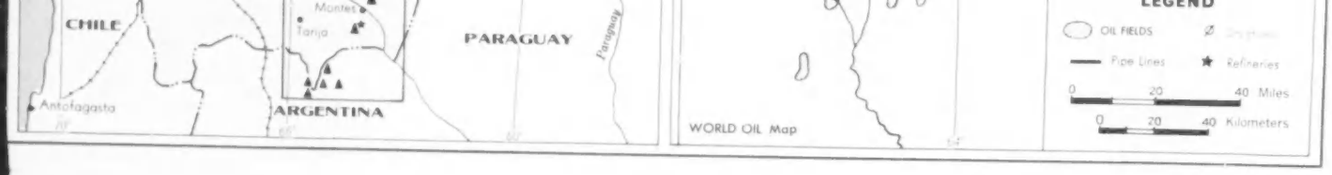

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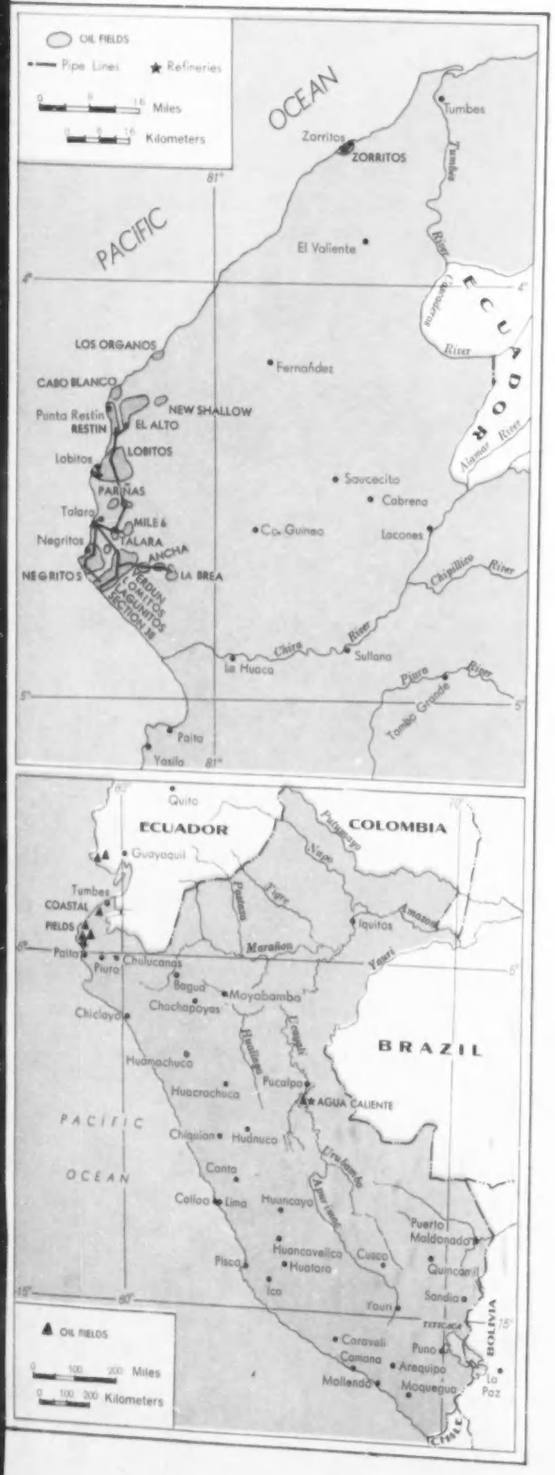

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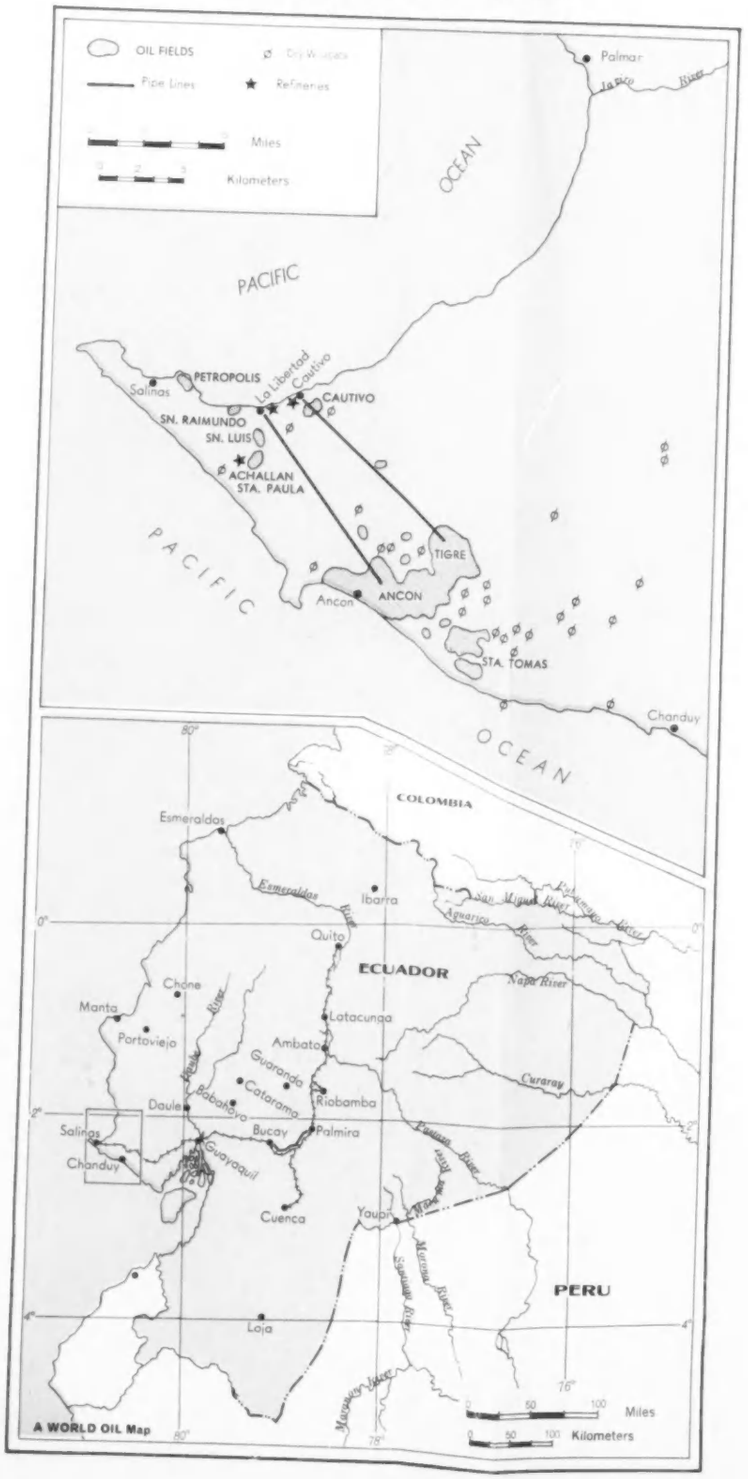
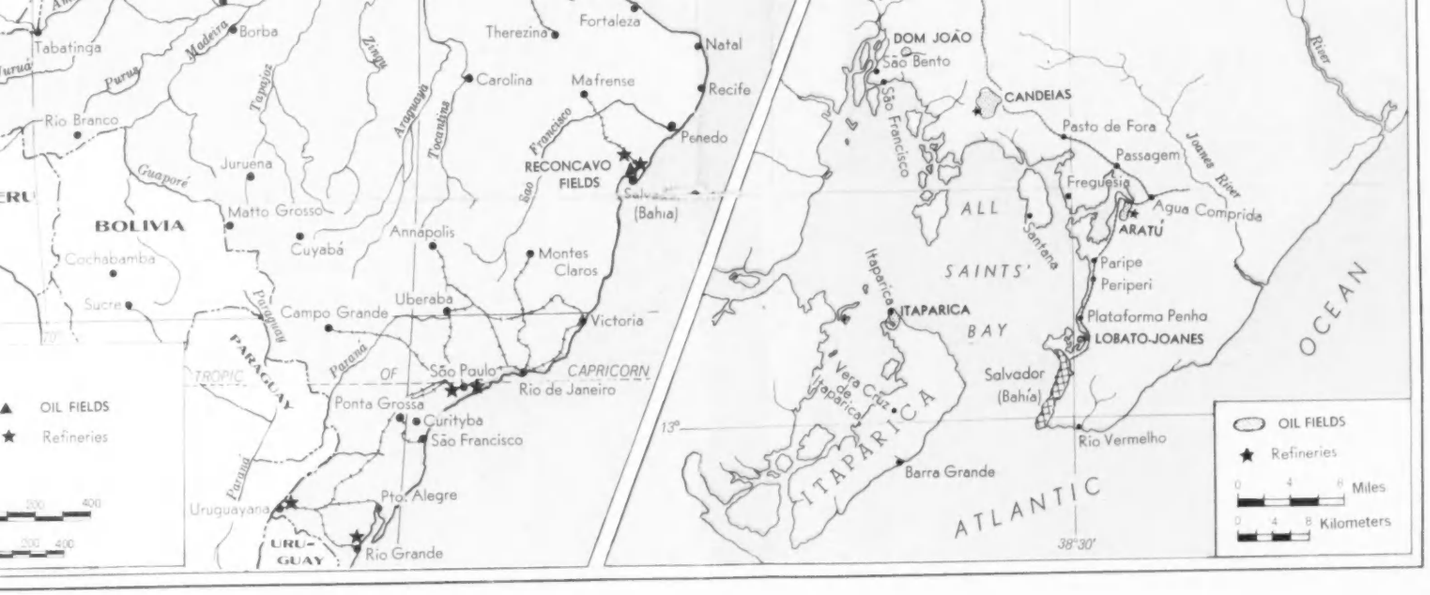
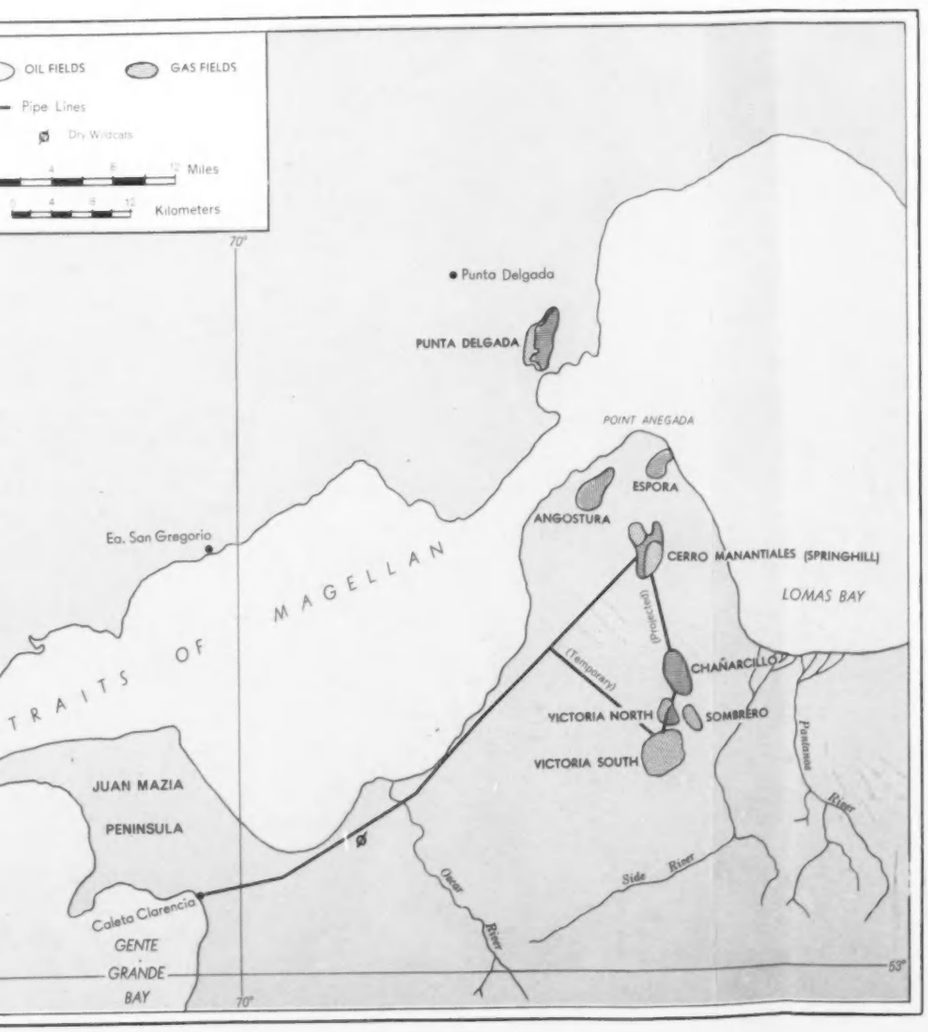
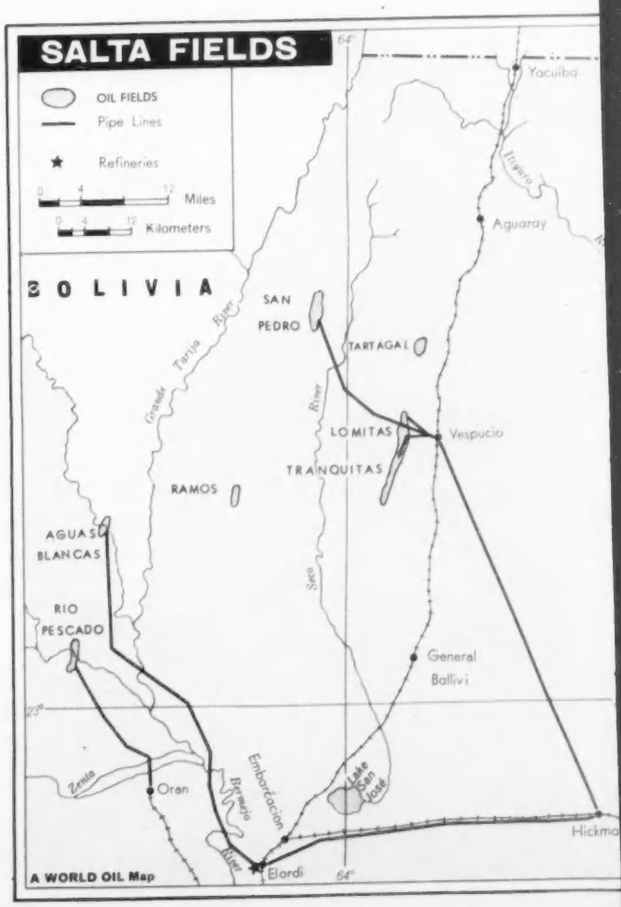
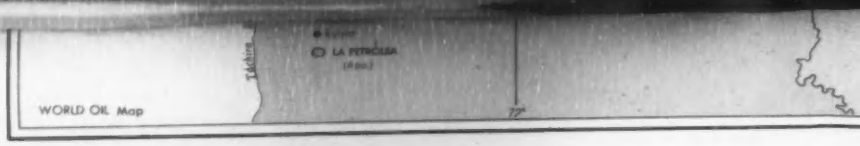



Tabatinga
Borba
Madeira
Purus
Juruá
Rio Branco
Juruena
Guaporé
BOLIVIA
Cochabamba
Sucre
Matto Grosso
Cuyabá
Annapolis
Campo Grande
Uberaba
Victoria
Montes Claros
Paraguay
PARAGUAY
Paraná
TROPIC OF CAPRICORN
São Paulo
Rio de Janeiro
Ponta Grossa
Curityba
São Francisco
Pto. Alegre
Uruguayana
URU-GUAY
Rio Grande
Therezina
Fortaleza
Natal
Carolina
Mafrense
Recife
Penedo
Araguaya
Tocantins
Tapajoz
Zingu
São Francisco
RECONCAVO FIELDS
Salvador (Bahia)
DOM JOÃO
São Bento
CANDEIAS
Pasto de Fora
Passagem
Freguesia
Agua Comprida
ARATÚ
Joanes River
ALL SAINTS' BAY
Santana
Itaparica
ITAPARICA
Vera Cruz de Itaparica
Paripe
Periperi
Plataforma Penha
LOBATO-JOANES
Salvador (Bahía)
Rio Vermelho
Barra Grande
ATLANTIC OCEAN
13°
38°30'
70°
OIL FIELDS
Refineries
Miles
Kilometers

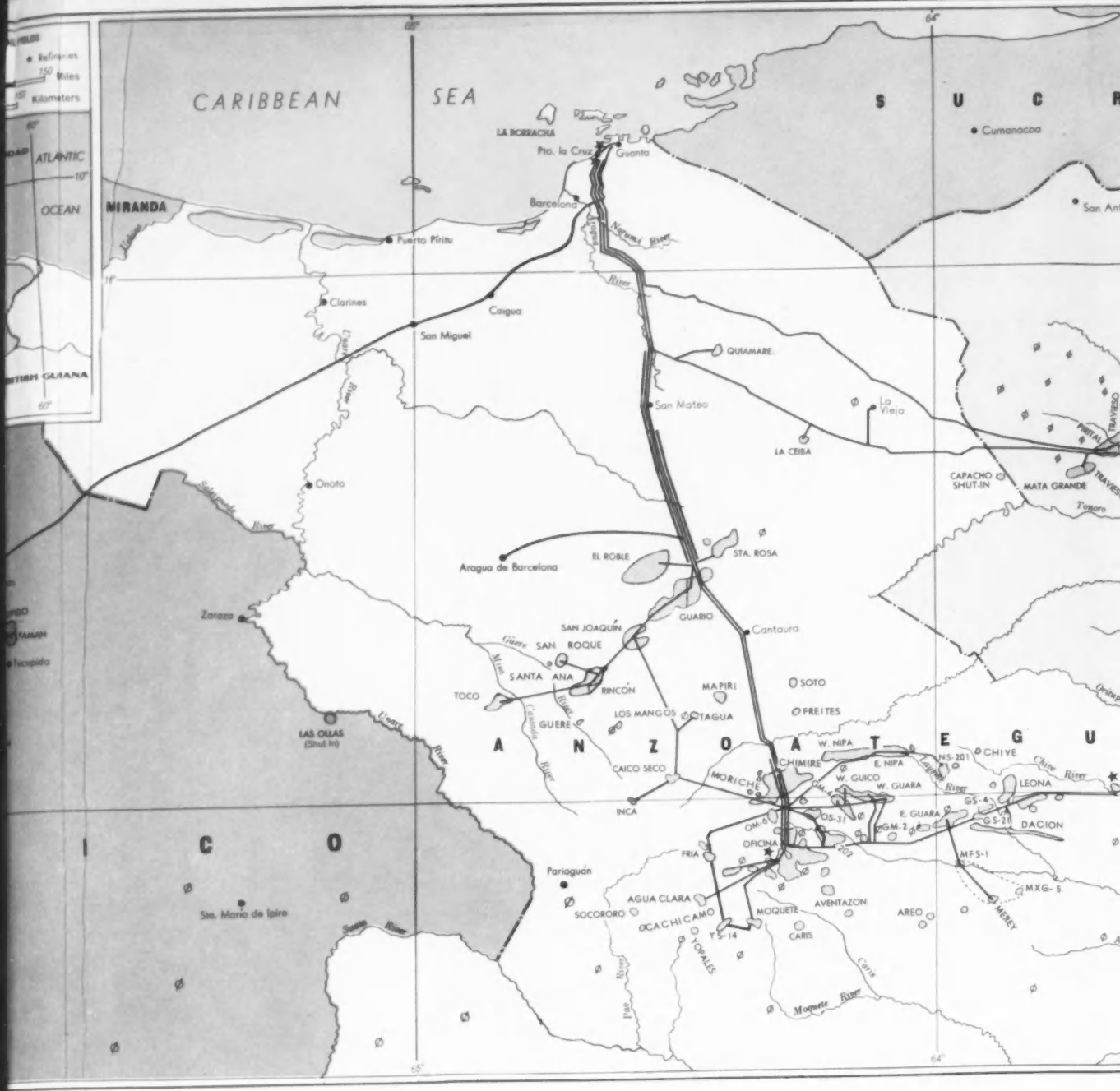
CHILE


OIL FIELDS
GAS FIELDS
Pipe Lines
Dry Wildcats
Miles
Kilometers
70°
Punta Delgada
PUNTA DELGADA
POINT ANEGADA
ESPORA
ANGOSTURA
Ea. San Gregorio
CERRO MANANTIALES (SPRINGHILL)
LOMAS BAY
MAGELLAN
STRAITS OF
(Temporary)
(Proposed)
CHAÑARCILLO
VICTORIA NORTH
SOMBRERO
VICTORIA SOUTH
JUAN MAZIA PENINSULA
Patamoni River
Oscar River
Side River
Caleta Clarencia
GENTE GRANDE BAY
53°
70°


SALTA FIELDS
OIL FIELDS
Pipe Lines
Refineries
Miles
Kilometers
64°
Yaculba
Aguaray
BOLIVIA
SAN PEDRO
TARTAGAL
Grande Tarija River
LOMITAS
Vespucio
TRAINQUITAS
RAMOS
AGUAS BLANCAS
RIO PESCADO
Seco
General Ballivi
Oran
Zenta
Embarcacion
Bermejo River
Lake San Jose
Hickman
Elordi
A WORLD OIL Map

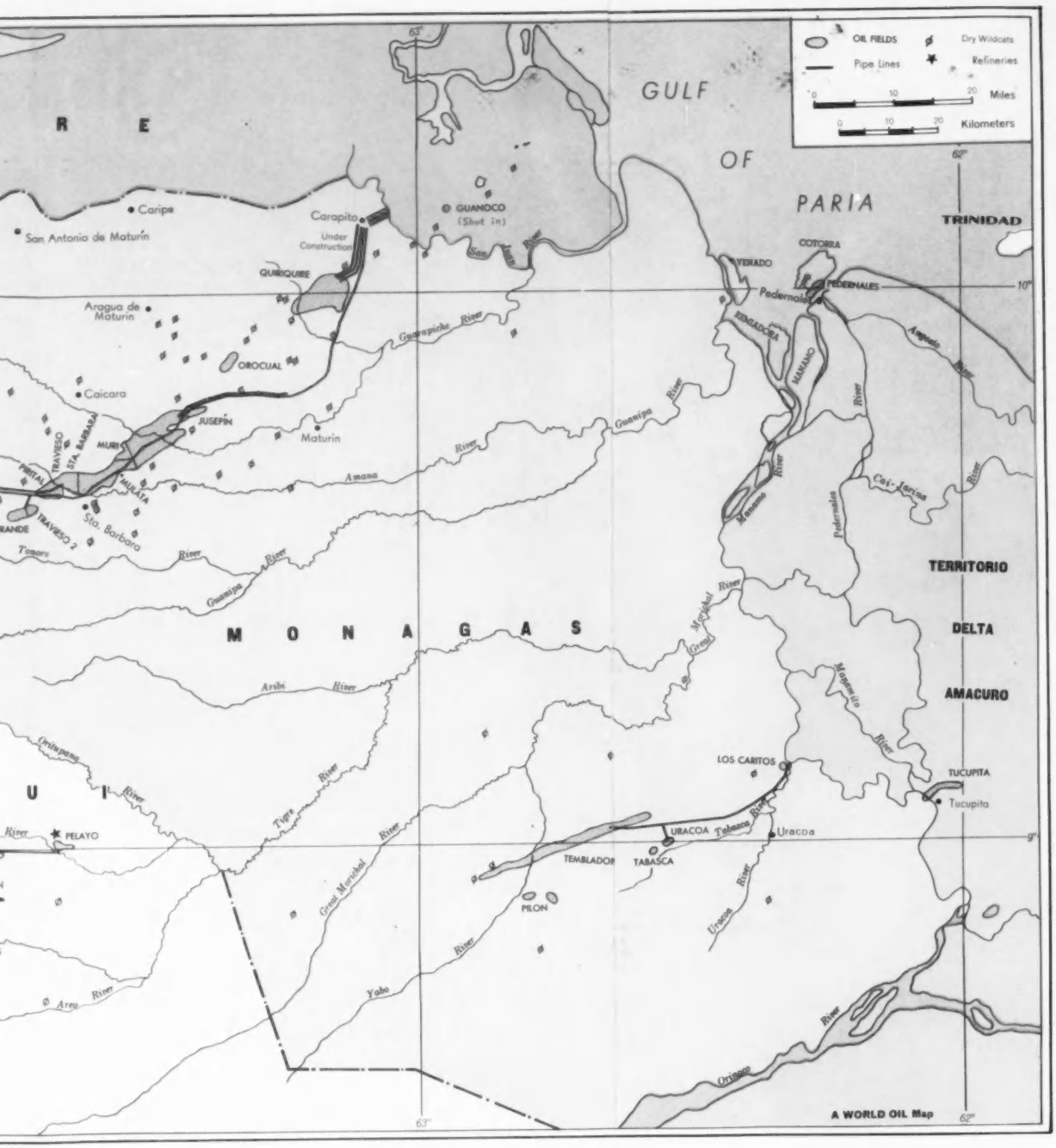


VENEZUELA–Central and Eastern Fie

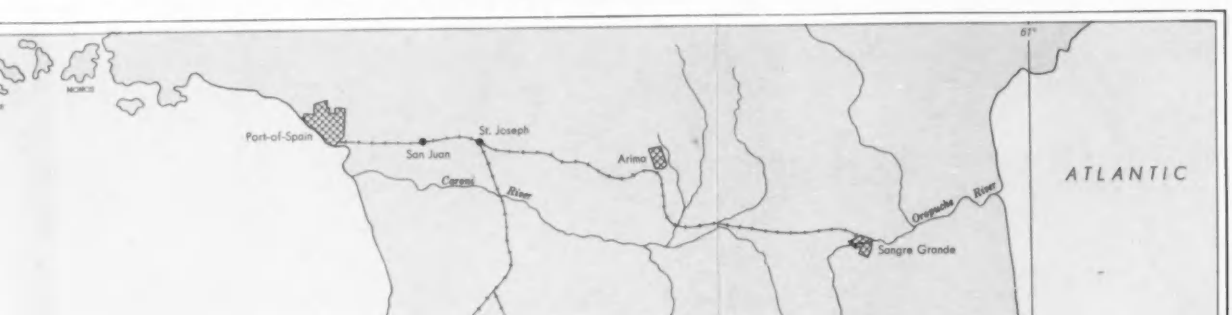


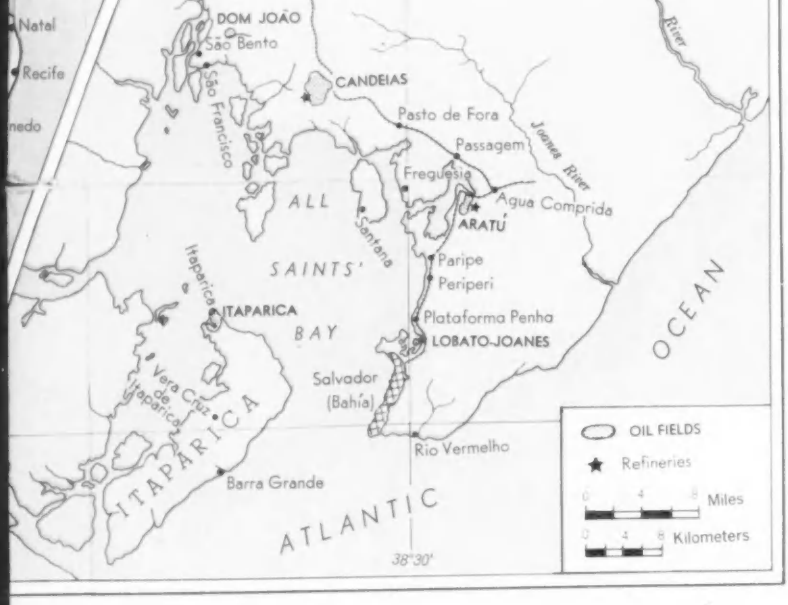
ZIL

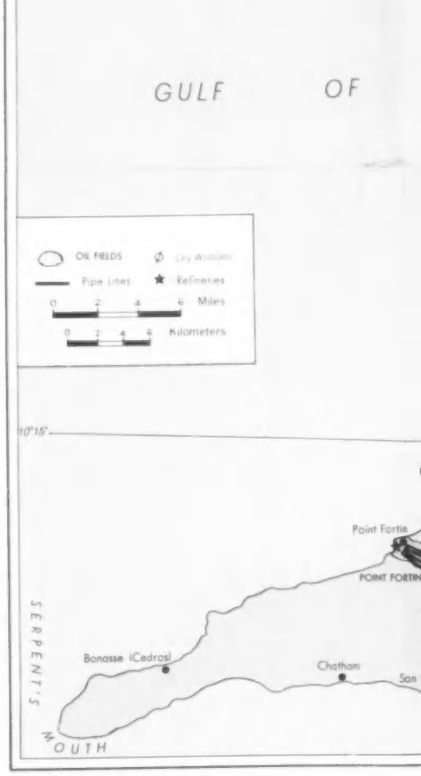
Fields

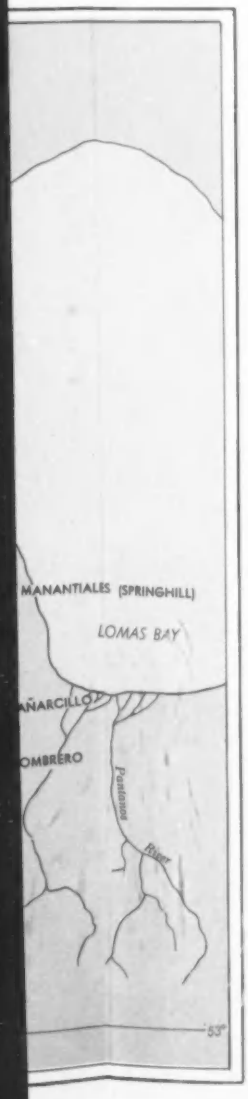


TRINIDAD

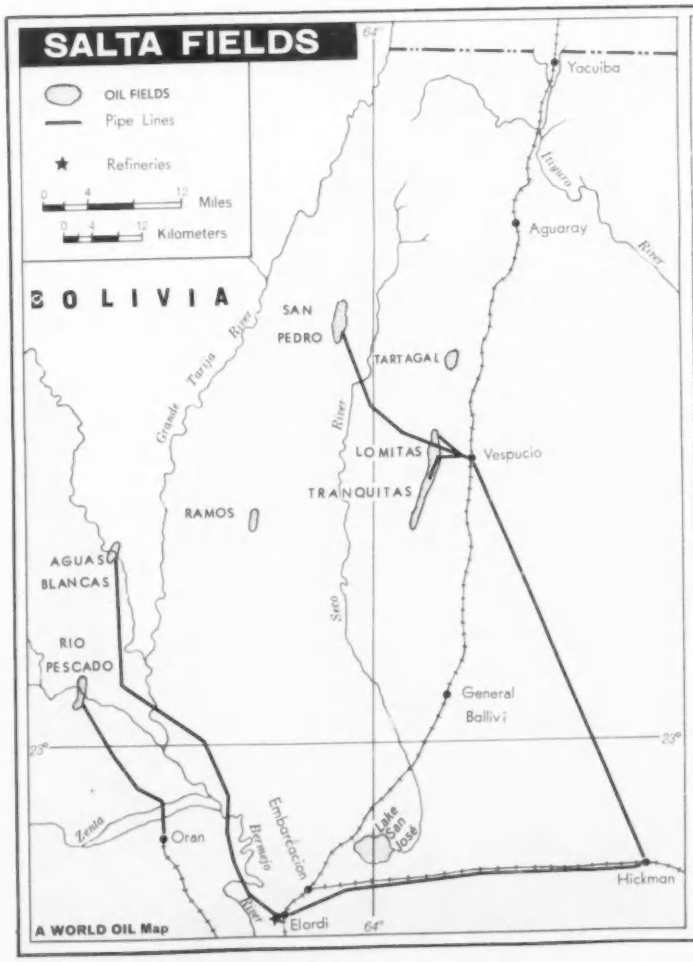


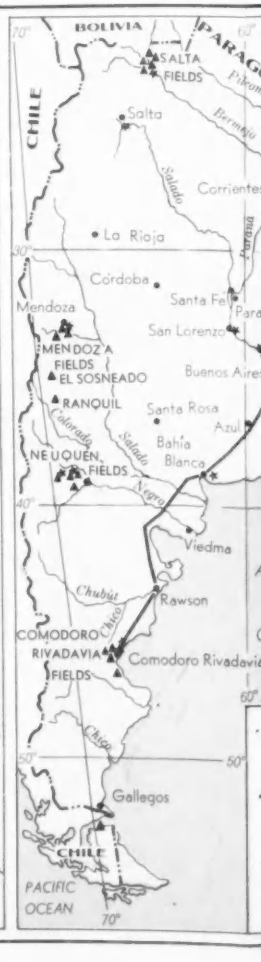

Natal
Recife
DOM JOÃO
São Bento
São Francisco
CANDEIAS
Pasto de Fora
Passagem
Joanes River
Freguesia
Agua Comprida
ARATÚ
ALL
SAINTS'
BAY
Santana
Paripe
Periperi
Itaparica
ITAPARICA
Plataforma Penha
LOBATO-JOANES
Vera Cruz
Itaparica
Salvador
(Bahía)
ITAPARICA
Rio Vermelho
Barra Grande
ATLANTIC
OCEAN
38°30'
OIL FIELDS
Refineries
Miles
Kilometers

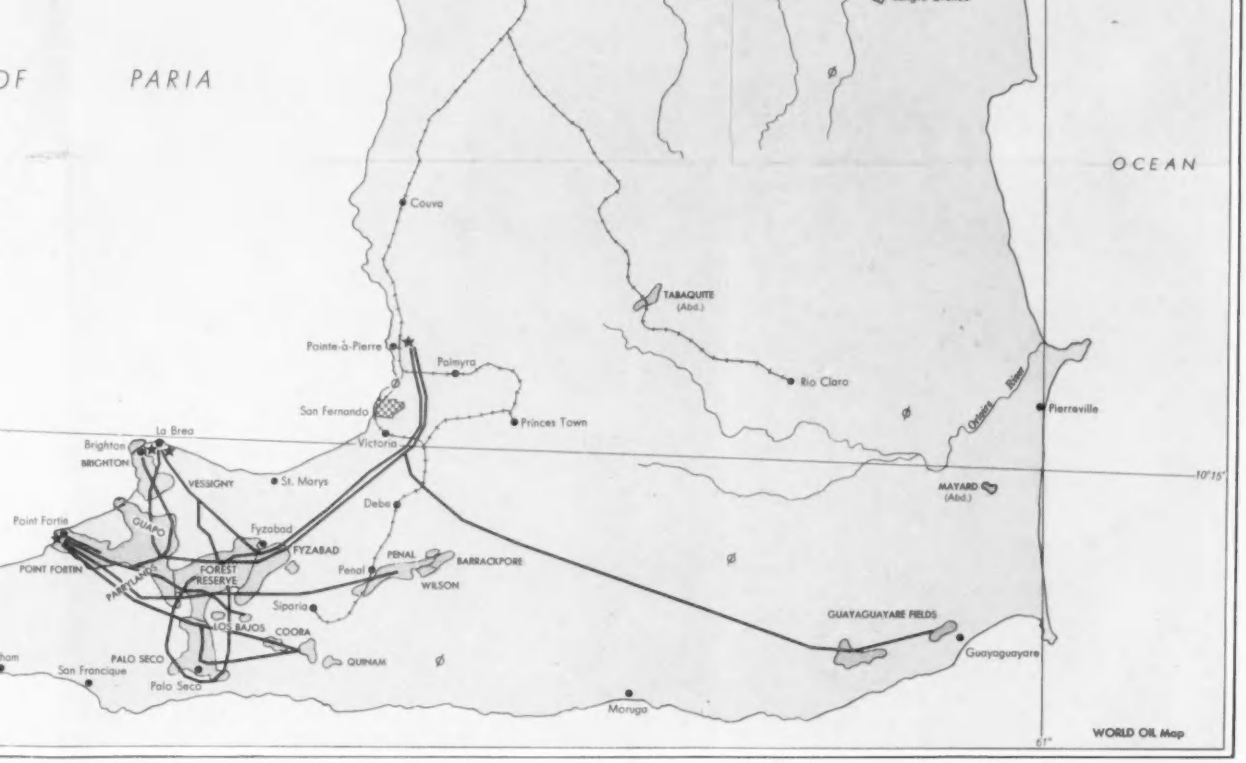

GULF OF
OIL FIELDS
Pipe Lines
Refineries
Miles
Kilometers
Point Fortin
POINT FORTIN
SERPENT'S
MOUTH
Bonasse (Cedros)
Chatham


MANANTIALES (SPRINGHILL)
LOMAS BAY
AÑARCILLO
OMBRERO
Fontana
River
53°

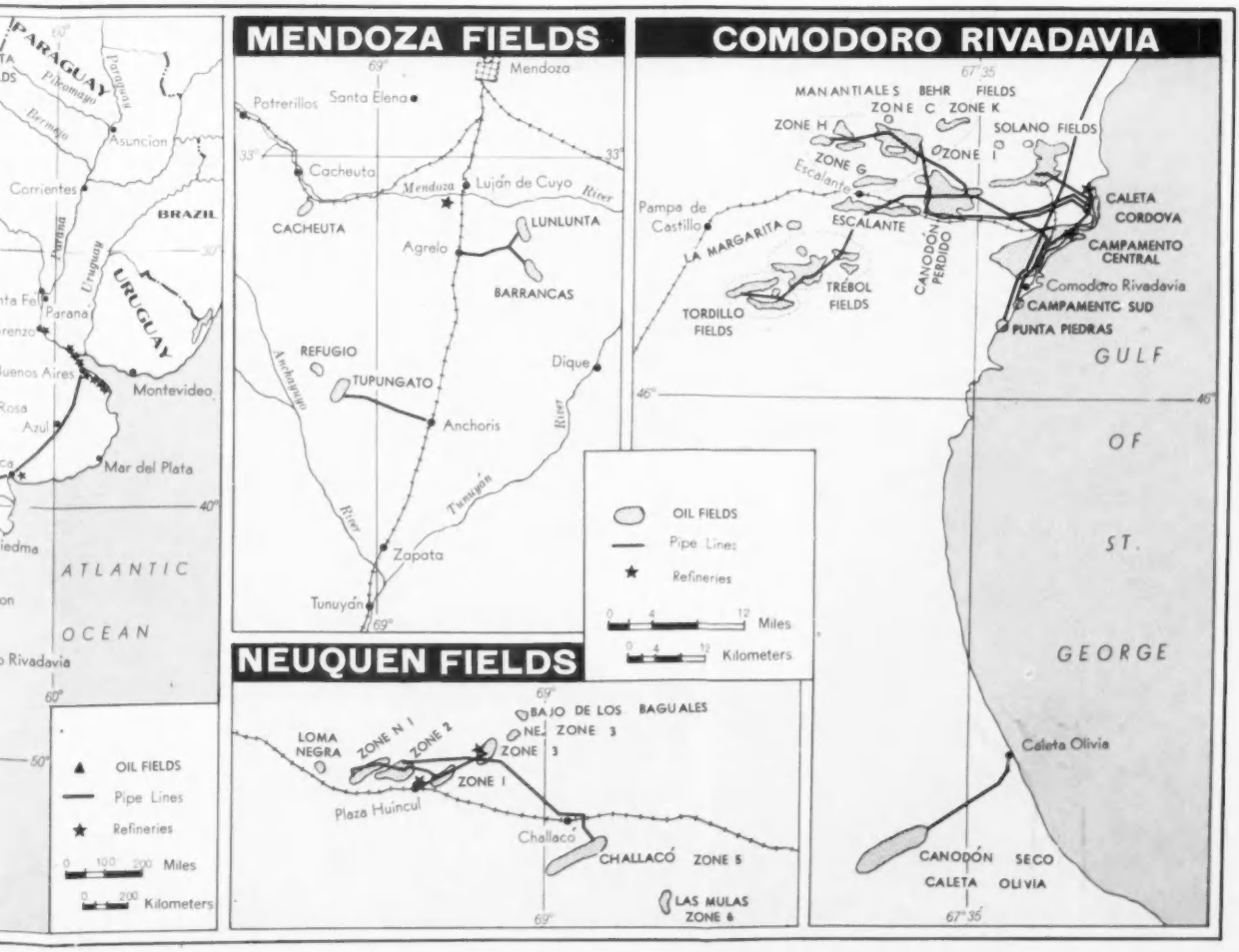
AR


SALTA FIELDS
OIL FIELDS
Pipe Lines
Refineries
Miles
Kilometers
BOLIVIA
SAN PEDRO
TARTAGAL
LOMITAS
TRANQUITAS
Vespucio
RAMOS
AGUAS BLANCAS
RIO PESCADO
Yacuiba
Aguaray
General Ballivi
Oran
Elordi
Hickman
Lake San Jose
Tarija River
Grande
Seco
Iruya
Bermejo
Embarcacion
A WORLD OIL Map
64°
25°


BOLIVIA
CHILE
SALTA FIELDS
Salta
La Rioja
Córdoba
Santa Fe
Mendoza
San Lorenzo
MENDOZA FIELDS
EL SOSNEADO
RANQUIL
Santa Rosa
Bahía Blanca
NEUQUEN FIELDS
Viedma
Rawson
COMODORO RIVADAVIA FIELDS
Comodoro Rivadavia
Gallegos
CHILE
PACIFIC OCEAN
70°
60°
50°
40°
30°


PARIA
OCEAN
Couva
TABAQUITE (Abd.)
Pointe-à-Pierre
Palmyra
Rio Claro
San Fernando
Princes Town
Pierreville
Orinoco River
La Brea
Brighton
BRIGHTON
Victoria
VESSIGNY
St. Marys
MAYARO (Abd.)
10°15'
Point Fortin
GUAPO
Fyzabad
FYZABAD
PENAL
BARRACKPORE
POINT FORTIN
PARTLANDS
FOREST RESERVE
Penal
WILSON
Siparia
LOS BAJOS
COORA
GUAYAGUAYARE FIELDS
PALO SECO
San Francique
QUINAM
Palo Seco
Guayaguayare
Moruga
61°
WORLD OIL Map

ARGENTINA


MENDOZA FIELDS
Mendoza
Patrerillos
Santa Elena
Cacheuta
Menduza
Luján de Cuyo
River
CACHEUTA
LUNLUNTA
Agrelo
BARRANCAS
REFUGIO
TUPUNGATO
Dique
Anchoris
Zapata
Tunuyán
69°
33°
NEUQUEN FIELDS
BAJO DE LOS BAGUALES
LOMA NEGRA
ZONE N 1
ZONE 2
NE. ZONE 3
ZONE 3
ZONE 1
Plaza Huincul
Challaco
CHALLACÓ ZONE 5
LAS MULAS ZONE 6
COMODORO RIVADAVIA
MANANTIALES BEHR FIELDS
ZONE H
ZONE C
ZONE K
SOLANO FIELDS
ZONE I
ZONE G
Escalante
Pampa de Castillo
LA MARGARITA
ESCALANTE
CANODÓN PERDIDO
CALETA CORDOVA
CAMPAMENTO CENTRAL
TRÉBOL FIELDS
TORDILLO FIELDS
Comodoro Rivadavia
CAMPAMENTO SUD
PUNTA PIEDRAS
GULF
OF
ST.
GEORGE
Caleta Olivia
CANODÓN SECO
CALETA OLIVIA
67°35'
46°
OIL FIELDS
Pipe Lines
Refineries
Miles
Kilometers
PARAGUAY
Asuncion
Corrientes
BRAZIL
URUGUAY
Parana
Montevideo
Buenos Aires
Mar del Plata
ATLANTIC
OCEAN
Rivadavia
60°
40°
50°

Gas Production in Germany

REGION and FIELD	Operating Company	Producing Wells End of 1951	GAS PRODUCTION (Millions of Cubic Feet) Daily at End of 1951	Year 1950	Year 1951	Cumulative Through 1951
EMSLAND:						
Bentheim	C. Deilmann	3	5.404	1,816.5	1,916.3	18,418.9
Emlichheim	Wintershall AG.	..	0.120	30.4	35.3	68.5
Frenswegen	Wintershall AG.	1	1.158	.....	74.4	74.4
Georgsdorf	Preussag	..	0.249	86.3	126.2	212.5
Lingen	Gew. Elwerath	..	0.731	207.8	235.6	443.4
Ruehlertwist	Wintershall AG.	..	0.070	.....	18.9	18.9
HAMBURG:						
Reitbrook	Preussag	8	0.223	68.6	74.6	9,715.3
HANOVER:						
Eddesse-Oelheim	Preussag	..	0.025	5.3	8.0	59.1
Eicklingen	Wintershall AG.	..	.....	.....	.....	412.5
Hillerse	.....	..	.....	.....	.....	11.1
Hohenassel	Gew. Elwerath	..	0.070	.....	26.2	26.2
Nienhagen	Gew. Elwerath	..	0.700	32.9	258.4	1,531.6
Oberg	Deutsche Vacuum Oel AG.	..	0.003	1.0	1.0	473.7
Quakenbrueck	Deutsche Vacuum Oel AG.	..	0.034	11.3	22.8	34.1
Steimbke	Gew. Brigitta	..	0.080	51.2	35.3	504.7
Suderbruch	Gew. Brigitta	..	0.130	6.4	37.4	43.8
Wesendorf	Deutsche Erdoel-AG.	..	0.104	37.7	44.3	217.1
SCHLESWIG-HOLSTEIN						
Heide	Deutsche Erdoel-AG.	..	0.133	30.5	33.3	1,179.5
Total	.....	12*	9.234	2,385.9	2,948.0	33,445.3

* All other gas production comes from oil wells.

PIPE LINES OF GERMANY

Deutsche Schachtbau & Tiefbohr Tmb GmbH: 13,500-barrel-a-day 6-mile, 6-inch crude line from Lingen-Dalum fields to Osterbrook on Dortmund-Ems Canal.

Deutsche Schachtbau & Tiefbohr GmbH and Gewerkschaft Elwerath: 6-mile, 6-inch crude line from Ruehlermoor field to Lingen.

Emsland-Erdoelleitung GmbH (C. Dielmann Bergbau GmbH, Gewerkschaft Elwerath, Preussag, Wintershall, A. G.: 10½-mile, 5-inch crude line from Ruehlertwist field to railway at Osterwald (Georgsdorf).

Erdoelbetrieg Reitbrook (Socony-Vacuum Oil Company, Inc., and Preussag): 5-mile, 6-8-inch crude line from Reitbrook to Warwisch on Elbe River.

Wintershall A. G.: 4700-barrel daily 3½-mile, 4-inch crude line from Emlichheim to railway at Emlichheim.

Preussag: 3½-mile, two 4-inch crude lines from Georgsdorf field to railway at Veldhausen.

Deutsche Vacuum Oel A. G. and Gewerkschaft Brigitta: 5-mile, 6-inch crude line from Suderbruch field to railway at Gilten.

Niedersaechsische Oelleitungs-GmbH: 7½-mile, 4-inch crude line from Hohne field to railway at Beedenbostel, near Celle.

Wintershall A. G.: 2½-mile gas line from Bentheim field to Nordhorn town.

C. Deilmann Bergbau GmbH: 18 Mmcf daily, 48-mile, 8-inch gas line from Bentheim field to Huels (Marl).

REFINERIES OF GERMANY

Chemische Fabrik Elektron: 700-barrel-a-day gasoline rerunning refinery at Griesheim (Darmstadt). Capacity is half-finished products charging capacity. Refinery situated in American occupation zone.

Zeller & Gmelin: 60-barrel daily skim-lube refinery at Eislingen (Wuerttemberg) in American occupation zone.

Benzin und Petroleum GmbH (Anglo-Iranian Oil Co.): 12,000 barrels per day skim-crack refinery at Hamburg-Finkenwerder in British occupation zone.

Coelner Benzin-Raffinerie GmbH: 300-barrel-a-day gasoline rerunning refinery at Cologne in British occupation zone. Capacity is half-finished products charging capacity.

Deutsche Erdoel AG: 1500-barrel daily skim-lube-asphalt refinery at Heide (Holstein) in British occupation zone.
1400 barrels per day skim-lube-asphalt refinery at Wietze (Hanover) in British occupation zone.
850-barrel daily refinery at Hamburg-Wilhelmsburg in British occupation zone.

Deutsche Gasolin AG: 2000-barrel-a-day skim-lube-asphalt refinery at Dollbergen (Hanover) in British occupation zone.

Deutsche Shell AG: 800 barrels per day gasoline rerunning refinery at Dus-

Oil Production and Producing Wells in Germany

REGION and FIELD	Operating Company	Year of Discovery	PRODUCING OIL WELLS END OF 1951 Flowing	Art. Lift	Total	CRUDE OIL PRODUCTION (In Barrels) Daily End of 1951	Year 1950	Year 1951	Cumulative Through 1951
BADEN:									
Forst-Weiher	Itag	1934	....	51	51	47	19,901	17,605	580,773
Weingarten	C. Deilmann	1936	....	85	85	70	21,658	25,928	317,019
EMSLAND:									
Adorf	C. Deilmann (Gewerkschaft Elwerath, Preussag, Wintershall A.G., 25 percent each)	1946	....	....	1	15	9,282	5,628	44,352
Emlichheim	Wintershall (90 percent) Deutsche Vacuum Oel A.G. (10 percent)	1944	....	48	48	2,535	1,075,949	943,110	3,979,618
Georgsdorf	Preussag (C. Deilmann, Gw. Elwerath, Wintershall, 25 percent each)	1944	....	....	112	2,890	1,568,196	1,275,722	4,505,274
Lingen	Deutsche Schachtbau & Tiefbohr-G.m.b.H.(Gw.Elwerath 50 percent)	1942	....	....	95	2,344	521,199	690,137	2,811,616
Ruehlermoor	Deutsche Schachtbau & Tiefbohr-G.m.b.H.(Gw.Elwerath 50 percent)	1949	....	....	53	2,500	215,208	675,717	896,728
Ruehlertwist	Wintershall (C. Deilmann, Gw. Elwerath, Preussag, 25 percent each)	1949	....	....		1,600	74,795	474,271	551,754
Scheerhorn	C. Deilmann (Gw. Elwerath, Preussag, Wintershall, 25 percent each)	1949	....	....	15	664	67,158	146,279	217,630
HAMBURG:									
Reitbrook	Preussag and Deutsche Vacuum, 50 percent each	1937	63	84	147	890	308,063	332,220	9,054,101
HANOVER:									
Adolfaglueck	Deutsche Erdoil-A.G.	1936	....	....	....	.....	28	.....	2,163
Broistedt	Preussag & Gw. Elwerath, 50 percent each	1937	....	9	9	90	41,678	37,163	305,248
Calberlah	Gw. Elwerath	1945	....	8	8	13	7,735	5,698	36,423
Eddesse-Nord	Preussag	1950	....	....	27	134	.....	18,228	18,228
Eddesse-Oelheim	Preussag & Deutsche Erdoel-A.G.	1876	....	....		42	14,826	13,615	1,670,397
Ehra	Deutsche Erdoel-A.G.	1939	....	13	13	9	3,878	3,290	75,689
Eichlingen-Wienhausen	Wintershall, Gw. Elwerath & ITAG	1937	....	18	18	180	74,599	66,073	1,877,111
Eeilte	Deutsche Vacuum & Wintershall (50 percent each)	1947	....	1	1	4	2,261	1,729	9,476
Eldingen	Gw. Elwerath	1949	....	....	14	1,130	47,159	330,323	377,748
Etzel	Preussag	1942	....	3	3	55	39,312	30,345	237,040
Fuhrberg-Hambuehren	Wintershall, Gewerkschaft Brigitta, ITAG	1939	....	228	228	920	373,695	373,541	3,755,723
Gifhorn	Deutsche Erdoel-A.G.	1935	....	43	43	40	12,215	13,041	316,298
Hademstorf	Deutsche Vacuum Oel A.G.	1941	....	11	11	145	85,736	59,724	534,174
Hemmelte-West	Gewerkschaft Brigitta (66.7 percent), Deutsche Vacuum Oel A.G. 33.3 percent)	1951	1	....	1	40	.....	5,089	5,089
Hohenassel	Gw. Elwerath, Preussag & Braunschweigische Bohrgesellschaft m.b.H (33.3 percent each)	1943	....	31	31	390	133,189	141,162	1,376,349
Hohne	Deutsche Erdoel-A.G.	1951	6	....	6	675	.....	111,356	111,356
Meckelfeld	Wintershall & Gw. Elwerath (50 percent each)	1938	....	21	21	40	19,628	16,079	374,951
Moelme	Gw. Elwerath	1935	....	23	23	55	30,436	28,189	1,044,382
Neinhagen-Haenigsen	Gw. Elwerath, Deutsche Vacuum Wintershall, Deutsche Ordoel, ITAG, Erz-und Erdoelhandelsgesellschaft, Ferd, Koller & Sohn	1889 1940	....	236	236	2,020	816,662	759,325	33,643,121
Oberg	Deutsche Vacuum, ITAG, G. Greiser	1919	....	72	72	175	72,016	68,537	2,393,165
Quakenbrueck	Gw. Brigitta (66.7 percent) & Deutsche Vacuum (33.3 percent)	1950	....	9	9	102	91,098	62,874	153,972
Steimbke-Rodewald	Gw. Brigitta & Deutsche Vacuum	1936	5	226	231	1,975	540,876	676,277	4,357,353
Stemmerberg	Gw. Elwerath	1948	....	....	....	.....	.....	.....	889
Suderbruch	Gw. Brigitta & Deutsche Vacuum (50 percent each)	1949	25	5	30	2,633	237,146	679,518	939,526
Thoeren	Deutsche Erdoel, Gw. Brigitta, Deutsche Vacuum	1941	....	60	60	301	102,200	107,940	1,239,934
Wathlingen	Wintershall	1950	....	....	9	308	4,830	63,721	68,551
Wesendorf	Deutsche Erdoel, Gw. Elwerath, Preussag	1943	39	19	58	1,631	526,169	598,892	3,158,534
Wietze	Deutsche Erdoel	1874	....	316	316	536	198,394	204,204	17,010,796
SCHLESWIG-HOLSTEIN:									
Heide	Deutsche Erdoel	1935	....	62	62	1,320	472,584	504,007	9,922,731
Hohenborn	Gw. Elwerath & Preussag (50 percent)	1949	....	....	....	.....	532	.....	742
	Total	....	139	1,682	2,147	28,518	7,830,291	9,566,557	107,976,024

seldorf-Reisholz in British occupation zone. Capacity is half-finished products charging capacity.
1000-barrel daily lube refinery at Hamburg-Grasbrook in British occupation zone. Capacity is half-finished products charging capacity.
9800 barrels daily skim-lube-wax-asphalt refinery at Hamburg-Harburg in British occupation zone.
15,000-barrel-per-day refinery at Wesseling in British occupation zone.
850 barrels daily refinery at Wilhelmsburg in British occupation zone.
450-barrel-a-day gasoline rerunning refinery at Hamburg-Wilhelmsburg in British occupation zone. Capacity is half-finished products charging capacity.
4000 barrels a day skim-lube refinery at Monheim-on-Rhine in British occupation zone. Capacity is half-finished products charging capacity.

Deutsche Vacuum Oel AG: 12,000 barrels daily skim-lube-wax refinery at Bremen-Oslebshausen in British occupation zone.
700-barrel daily lube refinery at Wedel-on-Elbe in British occupation zone. Capacity is half-finished products charging capacity.

Esso AG. (Standard Oil Co. of New Jersey): 13,200 barrels per day skim-asphalt refinery at Hamburg-Harburg in British occupation zone.

Gelsenberg Benzin AG: 14,400-barrel-a-day skim-hydrogenation refinery at Gelsenkirchen in British occupation zone.

Gewerkschaft Deurag-Nerag: 10,500-barrel daily complete refinery at Misburg (Hanover) in British occupation zone.

Gewerkschaft Erdoel Raffinerie Emsland: 12,000-barrels daily refinery under construction at Lingen-Holtzhausen in British occupation zone.

Georg Greiser: 110-barrel-per-day skim-lube refinery at Dollbergen (Hanover) in British occupation zone.

Johann Haltermann: 2000 barrels daily gasoline rerunning refinery at Hamburg-Wilhelmsburg in British occupation zone. Capacity is half-finished products charging capacity.

Mineraloel- & Asphaltwerke AG (MAWAG): 1150 barrels per day skim-asphalt refinery at Ostermoor (Holstein) in British occupation zone.

Mineraloelwerk Grasbrook GmbH (DEA): 1500-barrel-a-day lube-wax refinery at Hamburg-Grasbrook in British occupation zone. Capacity is half-finished products charging capacity.

Mineraloelwerke Albrecht & Co.: 250-barrel daily lube refinery at Hamburg-Grasbrook in British occupation zone. Capacity is half-finished products charging capacity.

Mineraloelwerke Peine (Schindler): 350-barrel-per-day skim-lube refinery at Peine (Hanover) in British occupation zone.

Mineraloelwerke Albert Sengewald: 470 barrels per day skim-lube refinery at Dedenhausen (Hanover) in British occupation zone.

Oelwerke Julius Schindler GmbH: 2400 barrels daily skim-lube refinery at Hamburg-Neuhof in British occupation zone.
380-barrel daily refinery at Peine Hanover, in British occupation zone.

Ruhrchemie A. G.: 5300-barrel-a-day refinery at Oberhausen-Holten in British occupation zone.

Union Rheinische Braunkohlen-Kraftstoff A. G.: 16,000-barrel-a-day skim-hydrogenation refinery at Wesseling (Cologne) in British occupation zone.

Wintershall A. G.: 1400 barrels per day complete refinery at Salzbergen (Emsland) in British occupation zone.

Badische Anilin- & Soda-Fabrik: 950 barrels per day skim-lube-wax refinery at Ludwigshafen-Oppau in French occupation zone.

Mineraloelwerke: 2200-barrel-a-day complete type refinery at Luetzkendorf in Russian occupation zone.

Kraftstcff-Handelsgesellschaft mbH: 750-barrel-a-day refinery at Essen.

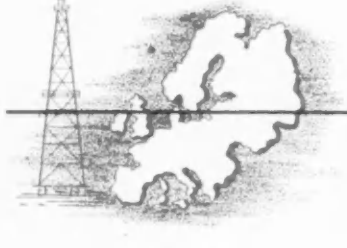
Anglo-Iranian Oil Co.: 1500 barrels daily refinery at Hamburg in British occupation zone.

Ebano Asphalt-Werke A. G.: 9000-barrels per day refinery at Hamburg-Harburg (Ebano) in British occupation zone.

Ernst Jung: 120-barrel-a-day refinery at Hamburg-Wilhelmsburg in British occupation zone.

Drilling in Germany

REGION and FIELD	WELLS COMPLETED IN 1950				WELLS COMPLETED IN 1951					Wells Drilling End of 1951
			TOTAL					TOTAL		
	Oil	Dry	Wells	Footage	Oil	Gas	Dry	Wells	Footage	
UPPER RHINE VALLEY:										
Forst-Weiher	3	3	6	15,833	....	....	2	2	4,584	....
Weingarten	8	2	10	15,833	10	....	1	11	12,242	....
Wildcats	....	....	....	....	....	....	4	4	14,889	4
BAVARIA:										
Wildcats	....	....	....	....	....	....	1	1	3,072	....
EAST FRIESLAND:										
Wildcats	....	....	....	....	....	....	4	4	16,890	1
EMSLAND:										
Emlichheim	28	....	28	72,528	15	....	2	17	40,199	1
Georgsdorf	43	2	45	134,516	18	....	....	18	49,807	1
Itterbeck	....	....	....	....	....	....	....	....	....	1
Lingen	25	....	25	77,797	27	....	....	27	84,939	5
Ruehlermoor	8	....	8	22,214	23	....	....	23	61,771	2
Ruehlertwist	12	....	12	34,603	17	....	2	19	55,212	....
Scheerhorn	4	1	5	18,477	11	....	....	11	40,158	1
Wildcats	....	8	8	32,546	....	2	9	11	29,481	3
HAMBURG:										
Reitbrook	4	2	6	12,503	4	....	....	4	2,647	....
Wildcats	....	1	1	5,385	....	....	....	....	....	....
HANOVER:										
Broistedt	1	....	1	4,270	....	....	3	3	6,784	....
Eddesse-Nord	....	....	....	....	7	....	3	10	10,453	2
Eldingen	2	1	3	16,931	9	....	2	11	50,035	3
Etzel	....	....	....	....	1	....	....	1	4,651	1
Fuhrberg-Hambuehren	41	6	47	41,297	24	....	14	38	42,724	6
Hemmelte-West	....	....	....	....	....	....	....	....	....	1
Hohenassel	2	1	3	5,300	5	....	2	7	15,037	1
Hohne	....	....	....	....	5	....	1	6	37,554	2
Mecklefeld	....	....	....	....	....	....	3	3	2,077	....
Nienhagen-Haenigsen	....	....	....	....	....	....	2	2	8,729	4
Oberg	1	3	4	4,330	1	....	3	4	3,233	2
Quakenbrueck	5	3	8	16,084	3	....	4	7	13,389	1
Steimbke-Rodewald	25	8	33	68,687	13	....	4	17	42,687	....
Suderbruch	3	....	3	14,492	25	....	1	26	122,212	4
Thoeren	1	....	1	1,045	3	....	....	3	10,941	1
Wathlingen	....	....	....	....	8	....	1	9	18,915	1
Wesendorf	14	4	18	42,025	15	....	3	18	37,487	7
Wildcats	2	39	41	170,848	1	....	38	39	143,148	12
N. RHINE-WESTPHALIA:										
Wildcats	....	2	2	9,127	....	....	2	2	12,642	2
OLDENBURG:										
Wildcats	1	1	2	6,439	1	....	....	1	4,346	1
SCHLESWIG-HOLSTEIN:										
Heide	10	5	15	50,327	14	....	11	25	78,835	1
Wildcats	....	6	6	26,494	....	....	9	9	27,730	4
WUERTTEMBERG:										
Wildcats	....	2	2	2,790	....	....	1	1	1,794	....
Total	243	100	343	922,721	260	2	132	394	1,111,294	75



GREAT BRITAIN

Output Shows 4090-Barrel Decrease from 1950 Figure; Only One of Five Fields Yields Increased Production

GREAT BRITAIN'S 1951 crude production reached 335,980 barrels, 4090 barrels less than the 340,070 barrels reported for the previous year. Output for 1951 showed Great Britain's cumulative total to 5,147,000 barrels.

With no flowing wells, all production came from 231 pumping wells, which were producing 1073 barrels daily at the close of 1951, including one pumper in Scotland which was yielding three barrels a day at year's end.

Of England's five fields, only one reflected an increase in crude yield in 1951. That field was the Eakring pool in Nottinghamshire, which produced 116,000 barrels of oil in 1951, 11,000 barrels more than during the previous year. Formby field in Lancashire dropped 50 percent to 1000 barrels.

Except for Eakring, all fields in Nottinghamshire decreased during 1951: Caunton fell from 9000 barrels to 8000 barrels; Duke's Wood, England's major producing area, decreased from 172,000 barrels in 1950 to 160,000 barrels in 1951; and Kelham Hills slipped 1000 barrels during the year from production of 51,000 barrels in 1950.

Total proven acreage in England amounts to 855 acres.

Exploitation likewise followed a declining trend during the year with the drilling of but a single well. The completion was reported from Formby field. It was abandoned at 4353 feet as a dry hole. During 1950, two wells were drilled—one at Formby and the second at Mansfield, in Nottinghamshire. Both were failures, and were abandoned at 3880 feet and 4490 feet, respectively.

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Baton Rouge, La.
Lake Charles, La.
Port Arthur, Texas
Beaumont, Texas
Houston, Texas
Baytown, Texas

Texas City, Texas
Freeport, Texas
Corpus Christi, Texas
Brownsville, Texas
Helena, Ark.
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INSPECTORS OF PETROLEUM

World's First Petroleum Inspectors

Early in 1952 came the announcement that, for the first time, an exploratory well was scheduled to be drilled on the Isle of Wight, off the south coast of England. D'Arcy Exploration Company, Anglo-Iranian Oil Company's prospecting subsidiary, will drill the test upon completion of the well which early in 1952 had reached 2000 feet near Ainsdale-on-Sea, Lancashire. The Isle of Wight drilling site is in the center of the island, about a half mile southwest of Arreton village.

Site for the proposed well was found by gravity meter survey and confirmed by seismic reflection surveys. Drilling there had been planned for several years, but the only locations suggested by geological surveys were on the edge of the sea and considered unsatisfactory for scientific reasons. Geophysical surveys followed, and the decision to drill in the middle of the isle resulted.

By 1953, AIOC's three major refineries in Britain—Llandarcy, Grangemouth and Kent—will have total capacity of 205,000 barrels daily. That will mark AIOC as the biggest producer of refined petroleum products in the country.

No oil fields have been found in Great Britain since 1943, when Caunton field was discovered. Production in England is found in the Upper and Lower Carboniferous sandstones, except in the Formby field. There, sandstone of the Triassic is the pay horizon.

Minimum depth to the top of the pay ranges from 80 feet at Formby to 2500 feet at Duke's Wood. At Caunton, the minimum to the top of the pay is 2170 feet; at Eakring 1780 feet; at Kelham Hills, 2050 feet.

Average thickness of the pay sections ranges from a maximum of 20-100 feet at Eakring to 12 feet at Caunton.

Maximum depth to the bottom of the pay horizons ranges from 250 feet at the shallow Formby field to 2640 feet at Duke's Wood.

Production at Formby field was found in a faulted monocline, and at Caunton, Duke's Wood, Eakring and Kelham Hills in domes with faulting.

Scotland's sole oil field, Dalkeith, which was found in 1937, produces from an average thickness of 30 feet at a depth of 1728 feet in an anticline of the Lower Carboniferous.

Scheduled for completion in 1952 was the largest oil dock in Britain—at Eastham, Cheshire, where the Manchester Ship Canal joins the estuary of the Mersey River. The dock was designed to receive the world's largest tankers which will feed Britain's expanding oil refineries.

A development envisaged for the future is a link lock for use by "through" canal traffic. During an average week in 1951, from eight to ten tankers passed through the canal in each direction. At Stanlow, two existing oil docks were in almost continuous use.

REFINERIES OF GREAT BRITAIN

England:

Esso Petroleum Company, Ltd.: 134,000-barrel-a-day cracking-distillation-gas absorption and treating refinery at Fawley (Southampton).
500-barrel daily distillation refinery at Port Ellesmere (Cheshire).

Anglo-Iranian Oil Company, Ltd.: 80,000 barrels daily distillation-lube-cracking refinery at Isle of Grain (Kent).

Berry Wiggins and Company, Ltd.: 2600 barrels per day distillation refinery at Kingsnorth (Kent).
1500-barrel daily distillation refinery at Weaste (Manchester).

Imperial Chemical Industries, Ltd.: Cracking refinery at Wilton (Middlesborough).

Lobitos Oilfields, Ltd.: 2500-barrel-a-day distillation-cracking refinery at Port Ellesmere (Cheshire).

Manchester Oil Refinery, Ltd.: 2800-barrel-per-day distillation-solvent refining plant at Trafford Park (Manchester).

Petrochemicals, Ltd.: Distillation-cracking-treating-fractionation refinery at Partington (Manchester).

Shell Refining and Marketing Company, Ltd.: 34,000-barrel-a-day distillation refinery at Heysham (Lancashire).
57,600 barrels daily topping-lube-asphalt refinery at Shellhaven (London).
72,000-barrel-a-day lube-asphalt-distillation refinery at Stanlow (Cheshire).

Vacuum Oil Company, Ltd.: 18,000-barrel-a-day lube-distillation refinery at Coryton (Kent).

Scotland:

Wm. Briggs and Sons: 700-barrel daily distillation refinery at Dundee, Firth of Tay.

Scottish Oils, Ltd.: 45,000 barrels a day distillation-cracking refinery at Grangemouth (Stirling) expanding.
3700 barrels per day distillation-wax refinery at Pumpherston (Midlothian).

Shell Refining and Marketing Company, Ltd.: 4300-barrels-per-day topping-asphalt refinery at Ardossan (Ayrshire).

Wales:

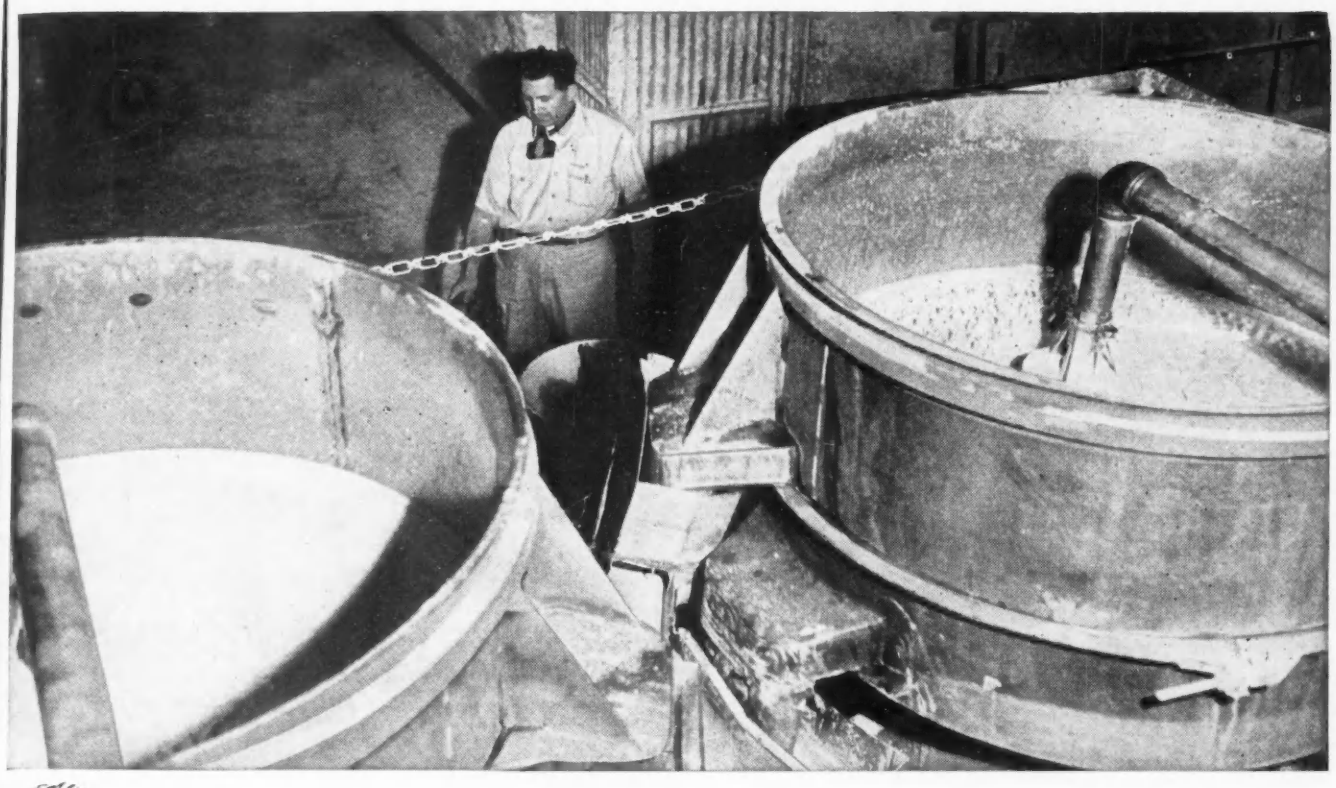
National Oil Refineries, Ltd.: 80,000-barrel daily distillation cracking-lube-wax-asphalt refinery at Llandarcy (Glamorgan) expanding.

Drilling Operations in Great Britain

COUNTRY, COUNTY and FIELD	WELLS COMPLETED IN 1951			WELLS COMPLETED IN 1950		
		TOTAL			TOTAL	
	Dry	Wells	Footage	Dry	Wells	Footage
ENGLAND:						
Lancashire:						
Formby	1	1	4,353	1	1	3,880
Nottinghamshire:						
Mansfield	....	....	.....	1	1	4,490
SCOTLAND:						
Midlothian Field	....	....	.....	....	....	.....
Total	1	1	4,353	2	2	8,370

Great Britain Oil Production and Geological Data

COUNTRY, COUNTY and FIELD	Year of Discovery	PRODUCING OIL WELLS END OF 1951			CRUDE OIL PRODUCTION (Barrels)				Proved Area (Acres)	Gravity of Oil (API)	Formation, Name and Kind	Geologic Age	DEPTH (Ft.)		Avg. Thickness of Pay (Feet)	Type of Structure
		Flowing	Art. Lift	Total	Daily End of 1951	1950	1951	Cumulative Through 1951					Min. to Top of Pay	Max. to Bottom of Pay		
ENGLAND:																
Lancashire:																
Formby	1939	....	9	9	3	2,000	1,000	64,000	25	37	Keuper; Sandstone	Triassic	80	250	20	Faulted Monocline
Nottinghamshire:																
Caunton	1943	....	10	10	22	9,000	8,000	181,000	50	23.9-31.1	Millstone Grit; Sandstones	Upper Carboniferous	2170	2300	12	Dome with faulting
Duke's Wood	1941	....	114	114	475	172,000	160,000	2,370,000	350	32.5-3.6	Millstone Grit; Sandstones	Upper and Lower Carboniferous	1800 2500	2270 2640	20-70	Dome with faulting
Eakring	1939	....	49	49	320	105,000	116,000	1,495,000	250	34.4-37.6	Millstone Grit; Sandstones	Upper Carboniferous	1780	2260	20-100	Dome with faulting
Kelham Hills	1941	....	48	48	250	51,000	50,000	1,016,000	180	27.1-29.3	Millstone Grit Sandstones	Upper Carboniferous	2050	2280	30-40	Dome with faulting
SCOTLAND:																
Midlothian:																
Dalkeith	1937	....	1	1	3	1,070	980	21,000	.....	39.6	Calciferous Sandstone	Lower Carboniferous	1728	1760	30	Anticline
Total	....	....	231	231	1,073	340,070	335,980	5,147,000	855							



Shaking the bugs out of a new screening idea

When Southwestern Engineering Company, of Los Angeles, came up with the idea of a screen separator with "bumps *and* grinds"—bouncing *and* vibrating action—they knew they had something.

Something that might speed up sluggish separating processes tremendously. In oil, for example, where the "sluggard" is mud... in chemical processing where it's thick sludges and mineral powders . . . in ceramics where it's a silica-clay-talc-water slurry called "slip."

The idea was swell. But working it out, finding the right metal for the cylinders, was a lulu.

They'd try one. It wouldn't meet the acid test ...quite. And would contaminate some products ever so slightly, but ever so disastrously.

They'd try another. Tons of jiggling mix would eventually break its back.

Still another. The cylinders would keep splitting at the seams.

Finally, they tried Monel. And they were in. No more trouble, no matter how much machines were overloaded or over-speeded!

First to take advantage of this new Sweco development was Gladding McBean & Co.

They installed the two Sweco separators shown here to screen clay slip for their famous "Hermosa" wall and floor tile. And by so doing, they improved their product because they were able to use a finer clay . . . boosted production because they could handle slip with only 40% instead of 51% water (thereby saving about 35% on fuel costs in the subsequent drying)...and increased the life of the screen cloth from *4 days to 26 months!*

Now what about your metal problem?

Could one or another of the Inco Nickel alloys help solve it? Very possibly. Write us about it. Remember, however, that Nickel and its alloys are on extended delivery. So anticipate need . . . order well in advance giving NPA rating and full end use information.

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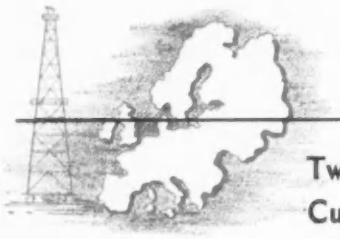


ITALY

Two Oil Wells and 22 Gassers Completed During 1951; Cumulative Crude Output Rises to 1,814,084 Barrels

CRUDE production in Italy during 1951 totaled 72,180 barrels, an increase of 401 barrels from 1950, upping the nation's cumulative output to 1,814,084 barrels. Twenty-nine wells were completed in the year, with a total footage of 109,163, as compared with 37 wells and a footage of 134,249 feet the previous year.

Two of the wells found oil, one each in the Cortemagiore and Vizzola fields. Twenty-two were gas wells, and five were dry holes. Fifteen of the gassers also were credited to Cortemagiore.

Activity of Italy's oil and gas industry continued to be affected by uncertainty over the creation of a state monopoly in the Po Valley. The government favors establishing a monopoly in oil and gas research and exploitation in the northern producing area. As a result, private capital companies interested in such research stopped further investments.

Societa Petrolifera Italiana, capital of which is controlled by the Esso Standard Italiana and by the Standard Oil Company (N. J.), and Societa "Petroli d'Italia," which operate oil and gas wells in Parma and Piacenza provinces, have restricted their activities to such an extent that the Fornovo refinery and the Fiorenzuola d'Arda refinery processed imported crude during the year instead of handling local production.

AGIP placed the Bordolano gas field into operation, and drilled a new oil well at Cortemagiore to a depth of 9840 feet. The well yielded from 15 to 35 barrels of crude a day.

Oil and gas exploration continued outside the Po Valley, especially in Central and Southern Italy. There, AGIP and several private concerns, such as the Montecatini Company and Surgi Company of Milan, found important gas structures. Lack of action on a new mining law by the Italian Parliament and Senate, however, precluded exploitation of such resources on an industrial basis.

Italian refining activities were stepped up during 1951. A reforming plant was put into operation at the Aquila refinery in Trieste, in addition to a lubricating oil unit.

The Italian Ministry for Industry and Commerce announced during the year that no new permits to build refineries in Italy would be issued in the future, and only applications for small expansions and technical improvements would be considered.

Construction was begun on 1490 miles of gas lines which will allow leading Italian industrial towns, such as Turin, Genoa, Vercelli, Novara, and Biella, to use methane gas from the Po Valley as fuel for operating industrial plants and for lighting and heating. Methane gas resources in the Po Valley have a producing capacity of 353 Mmcf daily for a period of 20 years.

Exports of Italian petroleum products again will be permitted to the sterling area and to members of the European Payments Union, the Italian Ministry of Foreign Trade announced in February, 1952. In order to further the export program, the Ministry of Industry authorized the import and refining of additional quantities of crude in the first quarter of 1952 against sterling payment.

Prospecting rights in Sicily are held by Anglo-Iranian Oil Company, Ltd., and a research permit was granted early in 1951 to American International Fuel & Petroleum Company, a subsidiary of Gulf Oil Corporation. Anglo-Iranian and other interests carried on some exploratory work during the year, and at the end of 1951 geologic and gravity meter exploration activities were being carried out by American International.

REFINERIES OF ITALY

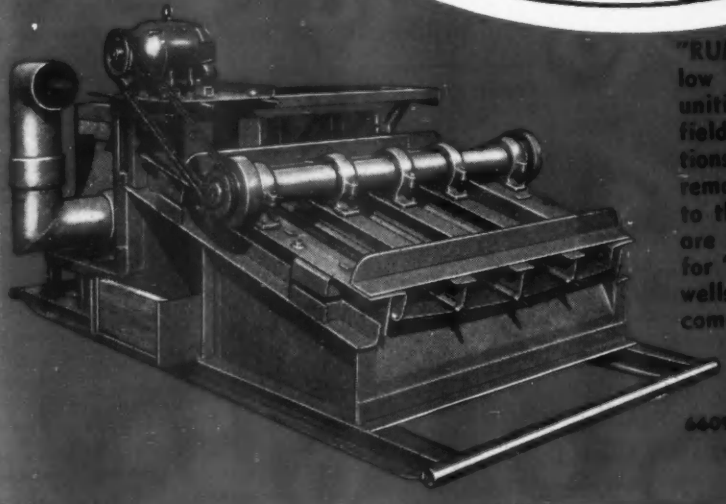
ROC: 4200-barrel-a-day lube refinery at Vado Ligure.
Anonima Italiana Petroli: 10,000-barrel daily skimming plant at Ancona.
"Aquila" S. A. Tecnico Industriale: 11,000 barrels daily complete type refinery at Trieste.
Azienda Petrolifere Italiano: 8000-barrel-per-day skimming refinery at Falconara.
Condor S. p. A. per l'Industrial Petrolifera e Chimica: 20,000-barrel daily complete type refinery at Rho under enlargement.
D. I. C. A.: 1000 barrels per day skimming refinery at Apuania (Massa).
Esso Standard Italiana: 1700-barrel-a-day lube refinery at Rivarolo.
6000 barrels per day skimming refinery at Trieste.
Ditta Garrone: 1000 barrels daily skimming plant at San Quirico.
Industrie Chimiche Italiane del Petrolio: 6000-barrel-a-day skimming plant at Mantua (Genoa).
Industria Italiana del Petrolio: 15,000 barrels a day complete type refinery at La Spezia.
Industria Raffinazione Olii Minerali, S. p. A.: 21,000-barrel daily complete type refinery at Porto Marghera (Venice) under enlargement.
I. R. C. D.: 150 barrels per day skimming refinery at Trieste.
Lombarda Petroli: 2000-barrel-per-day skimming plant at Monza.
N. I. L. O.: 200-barrel daily skimming plant at Milan.
Raffineria Olii Minerali: 900 barrels daily skimming refinery at Florence.
Raffineria Siciliana Industria Olii Minerali: 12,000-barrel-a-day complete type refinery at Augusta (Sicily).
ROL: 1000-barrel-per-day skimming plant at Viguzzolo.
S. A. Permolio Raffinerie Italiane Olii Minerali: 1600-barrel-a-day skimming refinery at Fumicino.
1600-barrel daily skimming refinery at Milan.
1600 barrels a day skimming plant at Genoa.
S. A. Raffineria Padana Olii Minerali: 13,000 barrels a day complete type refinery at Trecate under expansion.
Sirom Bianchi Petroli: 1000-barrel-per-day refinery skimming at Monza.
Societa Petroli d'Italia: 1700-barrel daily skimming refinery at Fiorenzuola d'Arda under expansion.
Societa Petrolifera Italiana: 700-barrel-per-day skimming plant at Fornovo Taro.
Soconv-Vacuum Italiana: 34,000-barrel-a-day topping plant at Naples.
21,000 barrels per day complete type refinery at Leghorn.
Stanic: 15,000-barrel-a-day Skimming plant at Bari.
S. T. O. I.: 250-barrel-a-day skimming refinery at Florence/Castello.

PIPE LINES OF ITALY

Condor L'Industrie Petrolifera e Chimica (Manchester Oil Refineries and private interests): 30,000-barrel-a-day, 90-mile, 12-inch crude line from Genoa to Rho.
Societa per Azioni Raffineria Padana Olii Minerali (Caltex and F.I.A.T.): 13,330-barrel daily, 97-mile, 8-inch crude line from Savona to San Martino di Trecate.
Societa Petrolifera Italiana (Standard of New Jersey): 2000 barrels daily, 4.6-mile, 3-inch crude line from Vallezza to Fornovo Taro.
500 Mcf, 3.7-mile, 6-inch natural gas line from Vallezza to Fornovo Taro.
250 Mcf, 1.7-mile, 3-, 4-inch natural gas line from Vizzola to Fornovo Taro.
2-mile, 2-inch natural gas line from Gallo to Montalbano.
Societa Nazionale Metanodotti: 180-mile natural gas line from Ferrara to Rovigo-Padova (Venice).
40-mile natural gas line from Rovigo to Ca' Capello.
60-mile natural gas line from Contarina to Chioggia-Porto Marghera.
Societa Idrocarburi Nazionali: Natural gas line from Consandolo to Bologna.
80,000 Mcf, 79-mile, 3-, 6-inch natural gas line from Bologna to Florence.
Azienda Generale Italiana Petroli (Government): 2-mile, 3-inch natural gas line from Boltiere to Crespi d'Adda.
4-mile, 7-inch natural gas line from Busto Arsizio to Gallarate.
8800 Mcf, 25-mile, 7-inch natural gas line from Casalbuttano to Brescia.
24-mile, 7-inch natural gas line from Castellanza to Varese.
68,800 Mcf, 39-mile, 7-, 8-, 10-inch natural gas lines from Caviaga to Cesano Maderno.
4250 Mcf, 33-mile, 3-inch natural gas line from Caviaga to Fiorenzuola.
15,500 Mcf, 63-mile, 5-, 6-, 7-inch natural gas line from Caviaga to Lecco.
3900 Mcf, 37-mile, 3-inch natural gas line from Caviaga to Milano.
1-mile, 7-inch natural gas line from Caviaga to Ripalta.
35,000 Mcf, 4-inch, 12-mile natural gas line from Cornegliano to Tavazzano planned.
880 Mcf, 45-mile, 13-inch natural gas line from Cortemaggiore to Caviaga.
35,300 Mcf, 12-mile, 7-inch natural gas line from Cortemaggiore to Piacenza.
4600 Mcf, 45-mile, 3-, 4-inch natural gas line from Cortemaggiore to Reggio Emilia.
120 Mmcf, 130-mile, 16-inch natural gas line from Cortemaggiore to Torino planned.
63,500 Mcf, 76-mile, 7-, 10-, 12-inch natural gas line from Credera to Novara planned.

"RUMBA" Model

SHALE SHAKER



"RUMBA" Shale Shakers EXCEL in performance and low maintenance cost! They come to you completely unitized on 10 ft. skids . . . no rigged-up costs in the field! The underslung Screen Cloth, with no obstructions on the bottom of the cloth to scrape sand off, removes sand by floating it out. This design contributes to the long Screen Cloth life that "RUMBA" Shakers are noted for and which is causing worldwide demand for "RUMBA" Shakers. Records of drilling six or seven wells with ONE "RUMBA" Screen Cloth are not uncommon. Write for prices and complete information.

HUTCHISON MANUFACTURING COMPANY

6409 AVENUE U — HOUSTON 11, TEXAS

105,943 Mcf, 180-mile natural gas line from Cortemaggiore to Piacenza, Voghera, Genoa.
320-mile natural gas line from Cortemaggiore to Vicenza.
7-mile, 2-inch natural gas line from Fombio to Pizzighettone.
25-mile, 7-inch natural gas line from Milano to Castano Primo.
16-mile, 10-inch natural gas line from Mortara to Novara planned.
25-mile, 8-inch natural gas line from Novara to Gozzano planned.
700 Mcf, 7-mile, 5-inch natural gas line from Podenzano to Piacenza.
10-mile, 10-inch natural gas line from Rivolta d'Adda to Boltiere.
19-mile, 12-inch natural gas line from Seregno to Como.

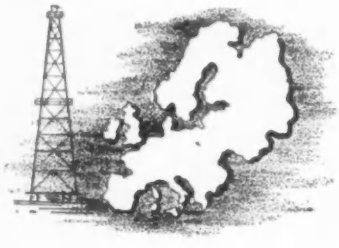
Italian map shows approximately 370 miles of natural gas lines completed in 1951 and 600 miles of new lines scheduled for completion in 1952. Diameters, capacities and lengths not known reported.

Drilling in Italy

STATE and FIELD	WELLS COMPLETED IN 1950				Wells Drilling End of 1951	WELLS COMPLETED IN 1951				
			TOTAL						TOTAL	
	Gas	Dry	Wells	Footage		Oil	Gas	Dry	Wells	Footage
EMILIA:										
Consandolo	3	3	6	6,194	2	..	1	1	2	2,700
Cortemagiore	14	3	17	65,318	4	1	15	3	19	69,515
Vizzola	1	1	2	4,580	1	1	1	1	3	6,415
Wildcats	..	1	1	5,890	..	..	..	..	..	.....
LOMBARDIA:										
Caviaga	6	..	6	27,478	n.a.	..	3	..	3	18,418
Ripalta	4	..	4	20,164	n.a.	..	2	..	2	12,115
Wildcats	1	..	1	4,625	n.a.	..	..	..	..	.....
Total	29	8	37	134,249	7	2	22	5	29	109,163

Oil Production in Italy

STATE and FIELD	Operating Company	Year of Discovery	CRUDE OIL PRODUCTION (Barrels)		
			Year 1950	Year 1951	Cumulative Through 1951
ABRUZZI MOLISE:					
Tocco Casauria	Azienda Generale Italiana Petroli (AGIP)	1935	3,086	4,115	46,947
EMELIA:					
Cutropozzi	Societa Petrolifera Italiana	1923	3,880	3,300	478,819
Cortemaggiore	AGIP	n.a.	15,474	18,115	42,165
Podenzano-S. Giorgio	AGIP	1935	8,141	7,200	59,912
Salsominore	Societa Petrolifera Italiana	1933	484	315	35,766
Settore Parmense	AGIP	1929	1,047	980	9,133
Vallezza-Monterotondo	Societa Petrolifera Italiana	1909	22,963	21,115	1,011,851
Vizzola	Soceita Petrolifera Italiana	1942	2,231	2,300	23,897
LAZIO:					
Ripi	AGIP	1940	4,105	3,915	49,553
LOMBARDIA:					
Caviaga	AGIP	n.a.	3,383	4,100	11,053
Ripalta	AGIP	n.a.	60	100	160
LUCANIA:					
Tramutola	AGIP	1937	3,939	3,810	43,692
TOSCANA:					
Pietramala	Societa Idrocarburi Nazionali	1939	2,986	2,815	n.a.
Abandoned Fields			.....	.....	1,136
Total			71,779	72,180	1,814,084



THE NETHERLANDS

Drilling and Production Reach New Highs in 1951; Expanded Program Carried Out in Schoonebeek Field

CRUDE oil production and drilling operations in The Netherlands reached new highs in 1951, with total output of 4,964,464 barrels, an increase of 65,764 barrels over 1950. Daily average production from the single producing field, Schoonebeek, at the end of the year averaged 11,680 barrels. This was a reduction from the peak rates of about 15,000 barrels daily reached in mid-1950.

In an effort to maintain the field's producing rate, the development drilling program was greatly expanded in 1950 with a total of 33 completions, of which 29 were oil wells and four were dry. This compared with 23 completions in 1950 for 19 oil wells. The results of drilling by N. V. Nederlandse Aardolie Maatschappij, jointly owned by the Royal-Dutch-Shell Group and Standard Oil Company (N. J.) with the sole producing concession in The Netherlands, indicated the producing sands of the Schoonebeek field reached farther than was originally anticipated and has extended the estimated period during which present production rates can be maintained. Production was from 143 wells at the end of the year.

Exploratory drilling has been continuous in The Netherlands, and as a result of about 12 tests drilling in 1951, two new discoveries of gas were made at Tubbergen and Denekamp, west of Schoonebeek. This brings to five the total gas discoveries made since 1948, and it is planned to commence production from these fields during 1952 with sales through the government to municipal distributors. Early in 1952 an oil discovery was indicated by NAM near Berkel in South Holland Province. Further testing was scheduled to determine if the well would show production in commercial quantities. Additional exploratory drilling in the area was to be conducted in 1952.

REFINERIES OF THE NETHERLANDS

N. V. de Bataafsche Petroleum Mij. (Shell): 100,000-barrel-a-day distillation-cracking-reforming-lube-asphalt refinery at Pernis.
N. V. Caltex Petroleum Mij. (California-Texas): 24,000-barrel daily skimming-cracking refinery at Pernis.

Drilling in The Netherlands

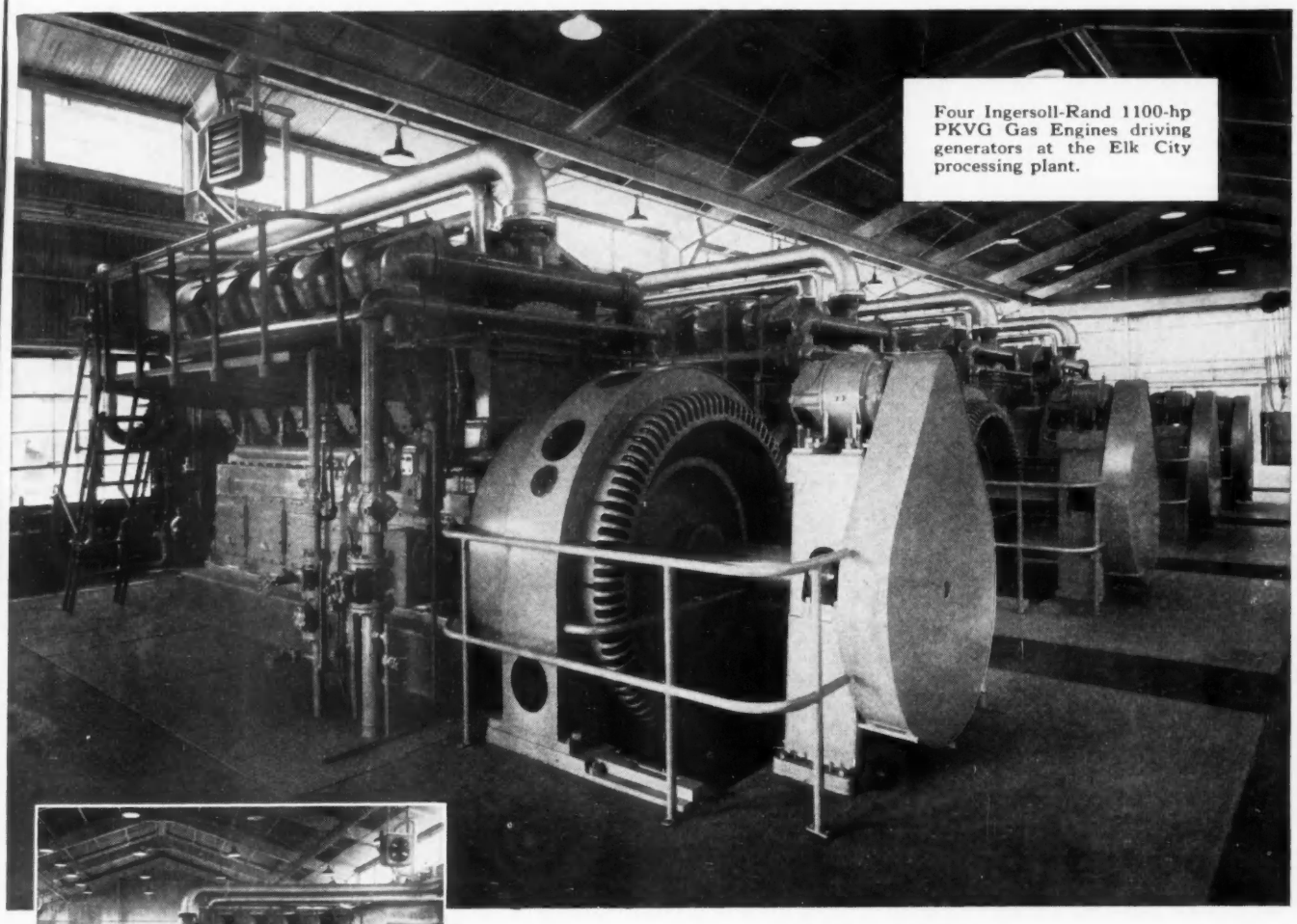
WELLS COMPLETED IN 1950				WELLS COMPLETED IN 1951				Wells Drilling End of 1951
		TOTAL				TOTAL		
Oil	Dry	Wells	Footage	Oil	Dry	Wells	Footage	
19	4*	23	62,800	29	4	33	104,134	1

* Includes two salt water disposal wells.

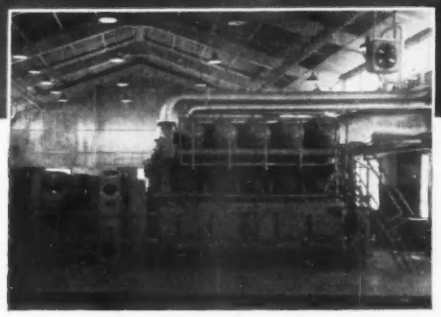
The Netherlands Oil Production and Geological Data

OPERATING COMPANY	Year of Discovery	Producing Wells End of 1951	CRUDE OIL PRODUCTION (Barrels)				Gravity of Oil (API)	PRODUCING FORMATION			
			Daily End of 1951	Year 1950	Year 1951	Cumulative Through 1951		Name and Kind	Geologic Age	Producing Depth (Feet)	Type of Structure
N.V. Nederlandse Aardolie Mij.*	1943	143	11,680	4,898,700	4,964,464	19,590,382	24.8	Valanginian, Sand	Lower Cretaceous	2500	Anticline

* Owned 50 percent by Royal Dutch-Shell Group and 50 percent by Standard Oil Company (N.J.).



Four Ingersoll-Rand 1100-hp PKVG Gas Engines driving generators at the Elk City processing plant.



ELK CITY PROCESSING AND GAS CYCLING PLANT Generates their Power with PKVG Gas Engines

Birth of an Oilfield

In 1946, Elk City was a sprawling agricultural community in western Oklahoma—typical of the kind of city that forms the backbone of this country. Oil geologists had probed the red soil of the rolling hill country around Elk City for many years. After starting oil drilling operations in September '46, it took 15 discouraging months of "nightmare" drilling and a $750,000 expenditure before success was achieved.

Today, with an investment totaling more than 32 million dollars, the Elk City oil and gas field processing unit is producing 15,000 barrels of crude oil daily, 225,000 gallons of natural gasoline and butane, and 55,000 gallons of propane.

All of the electric power at the Elk City Processing Plant is generated by four large PKVG units. Each engine develops 1080 bhp at 1960 feet altitude.

The PKVG is a modern V-type, heavy-duty gas engine—compact, accessible, and easy to install and operate. Its multi-cylinder, 4-cycle design assures smooth operation, reliability, and flexibility.

The low-cost maintenance and high operating economy of Ingersoll-Rand PKVG Gas Engines have become a tradition in the oil and gas industry. It took years of experience to build up this reputation—and all of this experience is at your disposal. Just call your nearest I-R representative.

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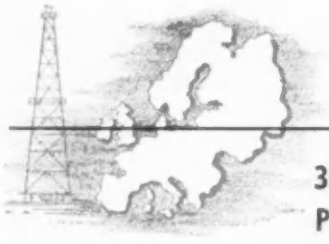

RUSSIA and SATELLITES

306,200,000-Barrel Output Claimed, Soviet Reserves Pegged at 5.5 Billion as Censorship Clouds Picture

RUSSIA made every effort again in 1951 to prevent dissemination of any oil industry figures, except those which were passed by Soviet censorship. Most of the figures released dealt in percentages with no known basis; however, the USSR did claim a specific production during the year of 306,200,000 barrels, or a daily average of 838,900 barrels. That figure included crude output from Sakhalin.

U. S. estimated USSR production for the previous year at 270,163,000 barrels, or 740,178 barrels a day. While any information approved by Soviet censors must be taken as a figure the Communists have disguised for the benefit of the Western World, one competent analyst of Russian economics estimates the Soviet Union and Sakhalin Island probably produced 287,500,000 barrels in 1951.

This is estimated to represent an increase of almost 29 million barrels from the 1950 production. Estimated, too, was the addition of a maximum of 11,950 barrels a day increase in refining capacity. Likewise, oil reserves were believed to have risen sharply.

Russia's reserves were put at approximately 7 billion barrels in 1938. Now, they are pegged at 5.5 billion barrels—an equivalent of 20 years of production at the current rate.

Baku oil fields, largest single source of Soviet petroleum, are producing substantially less now than they did before World War II. Baku's output in 1951 reached 112,623,000 barrels, about 43 million barrels less than in 1940 and 10,899,000 barrels less than the goal set by the fourth Five Year Plan.

Soviet oil production east of the Volga river spiraled during the year. The eastern regions produced about 119,889,000 barrels in 1951, as compared with 26,884,000 barrels in 1940. Pravda, official Soviet news agency, said prospect drilling in the Kuibyshev district was accelerated to such a degree that the annual program was completed by the end of October.

Russians were surveying and test drilling in the Schwadorf-Enzersdorf area. Drilling down to 6500 feet was reportedly under way.

In the third quarter of 1951, the USSR petroleum industry fulfilled its production goals set by the Five Year Plan at the rate of 103 percent, according to the Soviet Central Statistical Office.

REFINERIES OF U. S. S. R.

European Refineries (Government): 5 skim-crack refineries at Baku with total of 375,000 barrels daily capacity.
2000-barrel-a-day skimming refinery at Batumi.
28,000-barrel daily skim-crack refinery at C. Gorodki.
4 complete type refineries at Drohodyez, former Polish territory, with total capacity of 3000 barrels per day.
100 barrels a day skimming refinery at Gleboka (Sambor) in former Polish territory.
3 skim-crack refineries at Grozny, with combined capacity of 150,000 barrels daily.
1000 barrels per day skimming refinery at Gurev.
9000-barrel-a-day topping plant at Ishimbaevo.
25,000 barrels daily skimming plant at Krasnodar (Maikop).
2000-barrel daily skimming refinery at Makhach Kala.
2 skim-crack refineries at Molotov (Perm), with combined capacity of 12,000 barrels per day.
420-barrel-per-day skimming plant at Munkacs, in former Czechoslovakia territory.
200 barrels per day skimming plant at Nadworna, in former Polish territory.
500-barrel daily skimming plant at Novoba bogatinsk.
28,000-barrel-per-day skim-crack refinery at Orsk.
15,000 barrels a day skimming plant at Sterlitmak.
250-barrel-a-day skimming plant at Stryj, in former Polish territory.
35,000 barrels per day skim-crack refinery at Taupse.
28,000-barrel daily skim-crack refinery at Ufa.
1000 barrels a day skimming plant at Ustrzyl i Dolna, in former Polish territory.
9000-barrel-a-day skim-crack refinery at Yaroslavl.
1000 barrels daily skim-lube refinery at Zniesienie (Lwow).
Cracking refineries at Berdyansk, Gorki, Kherson, Leningrad, Moscow, Odessa, Saratov.
Topping refineries at Iskine and Ukhta.
Additional refineries at Boulova, Burguruslan, Chelyabinsk, Kazan, Kuibyshev, Nebit Dag, Nikolaev, Sernovo, Stalingrad, Syzran, Tbilisi (Tiflis), and Tuimaza.

Asiatic Refineries (Government): 4 skim-crack refineries at Fergana with combined capacity of 40,000 barrels a day.
4500-barrel-a-day skim-crack refinery at Khabarovsk.
4500 barrels daily skim-crack refinery at Komosomolsk.
4000-barrel-per-day skim-crack refinery at Krasnovodsk.
4500 barrels daily skim-crack refinery at Nikolaevsk.
Topping plant at Moskalvo.
Additional refineries at Irkutsk, Krasnoyarsk and Vladivostok.

Engineering and Geological Data on U.S.S.R. Asiatic Fields

AREA and FIELD	PRODUCING FORMATION		
	Age	Depth (Ft.)	Type Structure
Eastern Siberia Region:			
Ust Maya	.....	.....	.....
Sakhalin Island:			
Ekhabi	Upper Pliocene	310- 630	Anticline
Katangli	Upper Pliocene	2460	Anticline
Nutovo	Upper Pliocene	260-2885	Anticline
Okha	Upper Pliocene	300- 775	Anticline
Poromay	Middle & Lower Pliocene	8858	Anticline
Wigrek	Upper Pliocene	120- 220	Anticline
Turkmen Area:			
Cheklishlyar	Middle Pliocene	.....	.....
Cheleken	Pliocene	.....	Faulted Dome
Mangshlak	.....	.....	.....
Nepit-Dag	Middle Pliocene	820	Anticline
Neftedag	Upper & Middle Pliocene	.....	Anticline
Uzbek-Tadzhik-Kirgiz (Fergana) Area:			
Ak-Mecket	Eocene	.....	Anticline
Andizhan	.....	.....	Anticline
Barzik	.....	.....	Anticline
Changirtash	.....	.....	Anticline
Chimmon	Eocene	1000	Anticline
Chu	.....	.....	Anticline
Dzhar-Kurgan	.....	.....	Anticline
Eneumimsai	.....	.....	Anticline
Eno-Sing	.....	.....	Anticline
Kamishbashi	.....	.....	Anticline
Kanabad-Sai	.....	.....	Anticline
Kaudag	Oligocene	528	Anticline
Kim (Sel Rokho)	Eocene	.....	Anticline
Kirovabad	.....	.....	Anticlinal Fold
Komosol	.....	.....	Anticline
Kulmen	.....	.....	Anticline
Mailisai	.....	.....	Anticline
Melnikovo	.....	.....	Anticline
Mamangan	.....	.....	Anticline
Nefteabad	.....	.....	Anticline
Pavlan-Tash	.....	.....	Anticline
Pitaussai	.....	.....	Anticline
Ristananto	.....	.....	Anticline
Shor-Su (Kagnovich)	Eocene	650	Anticline
Tekebel	.....	.....	Anticline
Uch Kyzyl (Termez)	.....	.....	.....

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BRANCHES IN ALL PRINCIPAL OIL CENTERS IN THE UNITED STATES AND CANADA

Engineering and Geological Data on U.S.S.R. European Fields

AREA and FIELD	PRODUCING FORMATION Age	Depth, (Ft.)	Type Structure
Baku (Azerbaijan) Area:			
Artem (Holy Island)	Middle and Lower Pliocene	3500–9000	Anticlinal Fold
Baladzhary	Lower Pliocene	4729	Anticline
Bibi Eibat	Middle Pliocene	3500–5000	Anticline
Binagady	Lower Pliocene	1500–3116	Anticlinal Fold
Fatmay	Upper Pliocene	1788	Anticline
Kala	Upper to Lower Pliocene	2800–4200	Dome on Fold
Kara-Chkhur	Middle to Lower Pliocene	3440–9000	Anticline
Kara Dag	Middle Pliocene	5340	Anticlinal Fold
Kergez-Kyzyl Tepe	Middle Pliocene	.....	Anticline
Lenin (Balakhany, Sabunchy, Ramany)	Upper to Lower Pliocene	3800–5184	Anticline
Lok-Batan (Mikoyan)	Middle Miocene to Upper Pliocene	.....	Anticlinal Fold
Mahomedly	Upper Pliocene	.....	Anticline
Misdjik	Middle Pliocene	Shallow	Anticline
Nephte Chala	Pliocene	.....	Folded Fault
Peschanny	Middle to Lower Pliocene	.....	Anticline
Pirsagat	Middle Pliocene	4120	Anticlinal Fold
Puta (Molotov)	Middle Pliocene	.....	Anticlinal Fold
Sarynchа-Guilbakht	Middle Pliocene	.....	Anticlinal Fold
Shongar	Middle Pliocene	.....	Anticlinal Fold
Shuraabad	Oligocene	Shallow	Overthrust Fold
Shubany (Atashka)	Lower Pliocene	.....	Diapir Fold
Sion Shor	Lower Pliocene	5180	Anticlinal Fold
Siazan	Cretaceous and Oligocene	.....	Overthrust Fold
Surakhany	Upper to Lower Pliocene	3800–5200	Anticline
Sulu Tepe	Lower Pliocene	5200	Anticlinal Fold
Zykh (Beriya)	Middle and Lower Pliocene	.....	Anticlinal & Dome
Carpathian Area:			
Bitkow	Oligocene	3610	Anticline
Boryslaw	Oligocene (Eocene, Cretaceous)	4270–5700	Folds
Czarna	Oligocene	1310	Anticlinal Fold
Daszawa	Miocene	2300	Anticline
Kosmacz	Cretaceous	1920	Anticline
Lipic	Oligocene	1310	Anticline
Lodyna	Oligocene	1150–1900	Diapir Fold
Majdan	Eocene	590–1659	Anticline
Nahujowice	Oligocene and Eocene	535–656	Anticline
Opaka	Eocene	1970	Anticline
Orow	Cretaceous	300–1835	Fold
Perehinsko	Oligocene	2625	Anticline
Polana	Oligocene	325–685	Anticline
Rajskie	Oligocene	980–1300	Asymmetrical Fold
Rypne	Oligocene	400–3700	Fold
Schodnica-Urycez	Cretaceous	1480	Anticline
Slobada-Rungurska	Cretaceous	400–1000	Anticline
Strzelbice	Cretaceous	660	Anticline
Crimea Area:			
Chongelek	Middle Miocene	.....	Diapir Fold
Feodosiya	Middle Miocene	.....	Anticlinal Fold
Daghestan Area:			
Achi Su	Middle Miocene	985–2300	Anticlinal Fold
Berekei	Oligocene & Eocene Contact	.....	Domal Uplift
Dag Ogni	Oligocene	60–1000	Domal Fold
Duzlak	.....	.....	Dome
Isber Bash	Middle and Lower Miocene	3025–4685	Domal Anticline
Kaia Kent	Middle Miocene	655–1640	Anticline
Emba Area:			
Baichunas	Jurassic	.....	Salt Dome
Chernaya-Retchka	Jurassic	Shallow	Salt Dome
Dossor	Jurassic	246–690	Faulted Dome
Dshaksymai	.....	.....	Faulted Dome
Iskine	Jurassic-Salt Core Contact	2195	Salt Dome
Kraschaghyl	Jurassic	350–1200	Salt Dome
Kulsary	Jurassic	.....	Salt Dome
Makat	Jurassic	.....	Salt Dome
Novobogatinsk	Jurassic	.....	Salt Dome
Sagis	Lower Cretaceous and Middle Jurassic	328–2132	Faulted Dome
Shobarkuduk	.....	.....	Salt Dome

AREA and FIELD	PRODUCING FORMATION Age	Depth, (Ft.)	Type Structure
South Georgian Area:			
Malye Shiraki	Lower Pliocene and Upper Miocene	980–7850	Anticlinal Fold
Mirzaani	Lower Pliocene and Upper Miocene	980–7850	Anticlinal Fold
Grozny Area:			
Akhazovski	Middle Miocene	.....	Folded Overthrust
Ali Yurt	Middle Miocene	9185	Overthrust Fold
Bakovichi	Middle Miocene	.....	Anticline
Groskaya Mountain	Middle Miocene	3530	Folded Anticline
Grozny, New (October)	Middle Miocene	7220–10200	Anticline
Grozny, Old	Middle Miocene	7220–10200	Folded Anticline
Gudermes	Middle Miocene	3840–4595	Anticline
Gunuski	Middle Miocene	4315	Anticline
Makhkety	Middle Miocene	3280–3940	Anticline
Malgobek	Middle Miocene	990–2300	Anticlinal Fold
Pravoberezhnoye	.....	.....	.....
Voznessenka	Middle Miocene	990–2300	Anticlinal Fold
Kama River Area:			
Krasnokamsk	Permian & Upper Carboniferous	2950–3100	Anticline
Overiata	Permian & Upper Carboniferous	.....	Anticline
Polana	Permian & Upper Carboniferous	3400	Anticline
Sereokamsk	Permian, Upper Carboniferous & Devonian	3200–5840	Anticline
Shilovo	Permian	3152	Anticline
Verkhne-Chusovskiye Gorodki	Permian	3200	Buried Reef
Kuban-Maikop Area:			
Abuzy	Oligocene	2500–4920	Monocline
Adaghum	Upper Miocene	985	Diapir Fold
Asphalt Mountain	Lower Miocene & Oligocene	2240–2950	Monocline
Olsk	Oligocene	.....	Monocline
Kalujsky	Middle Miocene	.....	Monocline
Keslerovo-Varenikovo	Upper Miocene & Oligocene	1148–1640	
		2625–3280	Diapir Fold
Khadyzhensky	Oligocene	2240–3480	Monocline
Krymsky-Kudako	Middle Miocene	650–1640	Anticline
Kura-Tsite	Lower Miocene & Oligocene	2250–2950	Monocline
Kutaiss	Lower Miocene & Oligocene	2240–2950	Monocline
Maikop (Apsheron)	Lower Oligocene	1640–3480	Monocline
Sepsil	Oligocene	.....	.....
Shiraky	Lower Miocene & Oligocene	2240–2950	Monocline
Suvorov-Cherkess	Pliocene & Miocene	330–1475	Domal Uplift
Wax Mountain	.....	.....	.....
Pechora Area:			
Ukhta (Chibien, Ust Kulom, Yareg, Ozhma, Cherdin)	Devonian	.....	Anticline
Saratov Area:			
Dergachi	Upper Pliocene	383–3300	.....
Kurdium	Upper Pliocene	1716	.....
Teplovka	Upper Pliocene	1320	.....
Yelshanka	.....	.....	.....
Ukraine Area:			
Melitopol	Mesozoic	.....	Salt Dome
Poltava	.....	.....	Salt Dome
Romny	Mesozoic	.....	Salt Dome
Ural-Volga Area:			
Allaguvatovo	Lower Permian	1650–2085	Buried Reef
Buguruslan	Permian	985	Anticlinal
Buranchino	Lower Permian	1640–2085	Buried Reef
Ishimbaevo	Lower Permian	1640–2085	Buried Reef
Kusiankul	Lower Permian	1380–2490	Buried Reef
Kuzminovka	Lower Permian	.....	Buried Reef
Shugarov	.....	.....	.....
Smakaevo	Lower Permian	.....	Diapir Fold
Syzran	Upper & Lower Carboniferous	2130–3280	Domal Uplift
Termen-Yelga	Lower Permian & Devonian	2750	Reef
Tuimaza	Carboniferous	3440–3775	Buried Reef
Yablonovo (Stavropol)	Upper & Lower Carboniferous	2130–3280	Domal Uplift

ALBANIA

ALBANIA'S 1951 crude production of 2,401,920 barrels was approximately 300,000 barrels more than produced the previous year. Half this amount was refined in Albania's newest refinery, at Cerszic, near Tirana, Albania's capital. The refinery's capacity of slightly more than a million barrels annually includes skimming, cracking, lubes and asphalt refining.

Oil and oil products are closely rationed in Albania, for large volumes of the country's crude production have to be turned over to Soviet naval units, now permanently stationed in Albania. This nation, rich in mineral deposits, is one of the least mechanized of European countries. Therefore, oil is a substantial export item to other Soviet satellites.

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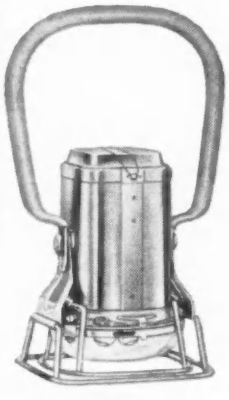

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Uses standard 6-volt battery. Two bulbs—either gives both "spot" and direct light. Tilts on base to any angle. Wide movable handle. 3½ inch chrome reflector and glass globe. Wt. 2½ lbs.

No. 2144-S (Model 44S) Lantern, less battery. List Pr., Each....$7.80

SAFETY FLASHING LANTERN WITH FLASHING OR STEADY BEAM

Similar to Model 2144-S above, but with red lens and flashing device. Instantly switches to either red flasher or white steady beam. Gives in excess of 52 hours of continuous flashing as Warning or Marking signal.

No. 2146-S, less battery. List each.....$10.40

3-CELL SAFETY FLASHLIGHT

Most convenient design. Stands on base. Fits pocket. Handles easily. Has carrying ring on bottom. Uses 3 standard flashlight batteries but measures only 5¾ x 3 x 2½. New improved construction guaranteed against breakage. Made of ethyl cellulose reenforced with metal. Neoprene rubber lens cap. "High Visibility" yellow color.

No. 1717-S Safety Flashlight, less batteries. List Pr. Ea....$4.35

No. 1717-S

U. S. BUREAU OF MINES APPROVAL

Safety Lantern No. 2144-S and No. 1717-S Safety Flashlight are approved by the U. S. Bureau of Mines in addition to other approvals.

Approved by Underwriters' Laboratories (Class 1, Group D) and Bureau of Marine Inspection and Navigation.

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NEW! EXTRA POWER 12-VOLT SAFETY FLASHLIGHT

Most powerful safety flashlight made. More than twice the power of ordinary safety lanterns yet more compact. Only 8" long. Fits in tool box. Has folding handles. Uses 8 standard flashlight batteries. Powerful "spot" beam. 2½" silvered reflector. Focusing. Made of rustproof metal, yellow enamel finish. Durable construction.

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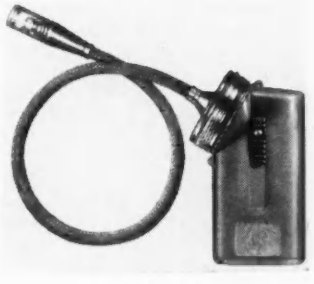

No. 1727-S

The first approved safety flashlight for use in inspecting barrels, pipes, machinery, etc. Uses 3 standard flashlight batteries in compact, ethyl cellulose case. Bronze, flexible extension takes and holds any desired curvature. Bulb is protected by unbreakable, transparent cap. Exclusive convertible feature permits unit to also be used as a standard flashlight. Available in two extension lengths.

No. 1727-15-S Flashlight with 15" Extension, less batteries. List Pr. Ea. $7.80.

No. 1727-30-S Flashlight with 30" Extension, less batteries. List Pr. Ea. $8.80.

JUSTRITE APPROVED SAFETY HEADLIGHTS

For work requiring both hands free. Headlamp fits around head. Heavy rubber cord, 4 ft. long, connects to battery case. 6-volt Powerful "spot" beam. For close work, use with spread-beam "Honeycomb" Lens, No. 1716.

Headlight uses 4 standard flashlight batteries in compact battery case that can be clipped to belt or slipped in pocket. Model 1904-S (at right) has an adjustable elastic headband that holds headlamp around head or cap. Model 1914-S is equipped with a wide flat hook to fit "hard" hats. 2½" reflector is silver plated. Focusing.

No. 1904-S Safety Headlight with elastic headband, less battery. List Pr. Ea. $5.85.

No. 1904-S

YELLOW FLASH 8 SAFETY HEADLIGHT

Model 1958-S is an 8-cell safety headlight, containing "convertible" features of other Yellow Flash 8 lights. Adjustable elastic headband with sponge rubber headpad and 48" weatherproof cord. Battery case clips on belt, takes one standard lantern battery or 8 flashlight cells for brilliant beam of light. List price $6.40, less batteries.

CZECHOSLOVAKIA

CZECHOSLOVAKIA produced 350,000 barrels of crude during 1951, an increase from the 280,000 barrels produced in 1950. Crude was imported during the year from Novorossisk through the Danube river to the Bratislava refinery, the annual capacity of which was enlarged to approximately 3¾ million barrels with the addition of a reforming unit. Due to a continuing shortage of electric power and coal, demand for gasoline and kerosine increased 20 percent during 1951.

The Prague government granted a credit of $50 million for purchase of oil research and drilling equipment from Skoda Iron Works, Eastern Germany and Russia during 1951. A program of national research and drilling was designed during the year to cover the zones of Karlovy, Plzen and Pardubice, where gravity meter surveys were scheduled to be completed before mid-1952.

HUNGARY

HUNGARIAN crude output rose in 1951 due largely to the imports of Russian drilling equipment, which arrived in the last quarter of the year. Production climbed 1,040,000 barrels from 1950 to 4½ million barrels.

Oil structures were discovered around Balaton Lake, and ten new wells were completed with a total depth of 80,579 feet and daily average output of 1,144 barrels.

Additional oil structures were found between Eger and Gyongyos, along the Matra mountains; however, drilling equipment shortage prevented more than two wells being completed in 1951. The wells were drilled to 6396 feet, where they each produced slightly more than 38 barrels daily.

Several projects for the enlargement of Hungarian oil refining were initiated during 1951. A plant at Esztergom, on the Danube river, will be enlarged to a processing capacity of 3,815,000 barrels annually. And it will receive a reforming unit which is being constructed in Russia. A 2,289,000-barrel refinery at Paks, on the Danube, and a 5,341,000-barrel refinery at Nagykanizsa will be provided with distillation installations which will be imported from Eastern Germany.

POLAND

POLAND'S crude output for 1951 was 1,298,325 barrels, according to Communist officials. If correct, this amount is about half the planned quota for the country's 1955 production, when, following the government's plan, the country will be able to supply all requirements from domestic sources.

With Poland, as the remainder of the satellite nations, most of the production went into military control and oil industry figures were largely referred to only in base-less percentages.

WORLD OIL sources report Poland fell behind its planned quota for 1951. Despite the purchase of additional machinery and equipment which assisted production during the second half of the year, the total crude yield was 7 percent shy of what the Communists expected. The nation's economy was hard-pressed because of the increased demand of the Soviet armed forces in Poland.

According to Polish officials, a modern petroleum refinery with a capacity amounting to four times total production of current refineries was under construction at Trzebinia. Construction of an asphalt plant at Zeran, a suburb of Warsaw, also was begun in 1951.

ROUMANIA

ROUMANIA'S 1951 crude production continued down. Sabotage by workers, drilling equipment shortages and refinery replacement difficulties took their toll. Slipping for the third year straight, the nation's oil yield dropped to 27 million barrels, down 4,609,000 barrels from 1950 production.

An escaped Roumanian industrial worker reported that in 1951 the Moinesti oil region, in the Bacau sector, underwent extensive exploitation.

A new refinery went on stream near the village of Darmanesti, on the Adjud-Ghimes line. Equipment for this refinery was obtained by dismantling the Ploesti refinery. In the winter of 1950-1951, another refinery was put into operation with Czechoslovak equipment under direction of Czechoslovak technicians.

In the spring of 1951, wells at Darmanesti, Pacurita, Harja, and Targu Ocna in the Slanicul Moldevi region had reached about 5000 feet. At two sites, Harja and Pacurita, oil was discovered in June. By summer 1951, 17 oil wells were being drilled in the Harja-Pacurita areas.

This oil will be sent directly to the Darmanesti refinery. A pipe line will be built to connect the refinery area with Adjud and the Ungheni-Iasi region.

The Targu Ocna, Darmanesti, Comanesti and Moinesti area has taken on the aspects of an industrial region, with thousands of workers employed on varied construction jobs.

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YUGOSLAVIA

YUGOSLAVIA produced 1,155,215 barrels of crude in 1951—666,215 barrels more than during the previous year—according to claims coming out of that country.

Petroleum research and exploitation work was continued through the year in the triangle between Maribor, Celje and Ptuj in northwestern Yugoslavia, where at a depth of 5759 feet, gas structures were discovered. The gas horizon yielded 3½ Mmcf of natural gas daily.

Three wells were completed in the zone between Skoplje, Tetovo and Gostivar. However, an output of only 74½ barrels a day was reached at a depth of 6150 feet.

The Rjeka oil refinery, which formerly belonged to Italian interests, operated during the year at full capacity. Plans were initiated during 1951 to provide the refinery with a new distillation and cracking plant to increase its annual crude processing capacity to 6 million barrels.

In addition, two refineris are planned. The refinery proposed at Dubrovnik, in Dalmatia, will have an annual crude processing capacity of 2½ million barrels. The second, at Smederevo, will have a capacity of 1,750,000 barrels a year. Both refineries are due to be completed during 1953.

ALGERIA

ALGERIA crude production rose 49,489 barrels in 1951 from 51,893 barrels produced in 1950, raising the cumulative total to 165,036 barrels. The Oued Gueterini field, operated by the Societe des Petroles d'Aumale, produced 47,000 barrels in 1951 from 25 wells.

Fifty-three wells were completed last year, more than 50 percent greater than 1950's 25 completions. Twenty-eight wells found oil, one was a gasser and 24 were failures. Total footage for the year was 142,010, 60,210 feet more than during the previous year. Half of the dry holes were drilled in the Cheliff Basin, seven at Hauts Plateaux (oued Gueterini), four at Sidi Aissa, and one at Hodna. Fifteen producers were completed in 1951 at Sidi Aissa and 13 at Hauts Plateaux.

Oil Production and Producing Wells in Algeria

REGION and FIELD	Operating Company	Year of Discovery	Producing Wells 1951	CRUDE OIL PRODUCTION (Barrels) Year 1950	Year 1951	Cumulative Through 1951
Oued Gueterini	Societe des Petroles d'Aumale	1949	25	26,000	47,000	83,000
Sidi Aissa	Societe Nationale de Recherche & d'Exploitation des Petroles en Algerie	1948	15	25,893	54,382	82,036
Total			40	51,893	101,382	165,036

Drilling Operations in Algeria

REGION and FIELD	WELLS COMPLETED IN 1951 Oil	Gas	Dry	TOTAL Wells	Footage	Wells Drilling End of 1951	WELLS COMPLETED IN 1950 Oil	Dry	TOTAL Wells	Footage
Cheliff Basin	..	..	12	12	60,328	2	..	16	16	66,500
Hauts Plateaux (Oued Gueterini)	13	..	7	20	42,400	2	5	4	9	15,300
Sidi Aissa	15	1	4	20	33,713	....	..	..	....	.....
Hodna	..	..	1	1	5,569	1	..	..	....	.....
Total	28	1	24	53	142,010	5	5	20	25	81,800

EGYPT

16,299,191-Barrel Production in 1951 Sets New Mark; Government Attitude Makes Future Increases Doubtful

WHILE Egypt's crude oil production in 1951 set a new high of 16,299,191 barrels, an increase of 188,056 barrels over 1950, the year-to-year rise was the smallest in the postwar period. Indications were that no further increases will be shown, barring a complete change of attitude of the Egyptian government towards the petroleum industry.

With measurable oil production dating back to 1911, Egypt's total output, which at the end of the year averaged 45,953 barrels daily and through mid-1952 had shown no appreciable change, fell nearly 4000 barrels per day short of domestic requirements. Failure of the government to remove hardships placed on the two remaining foreign producing concessionaires, however, resulted in decisions early in 1952 by both companies to halt further drilling operations.

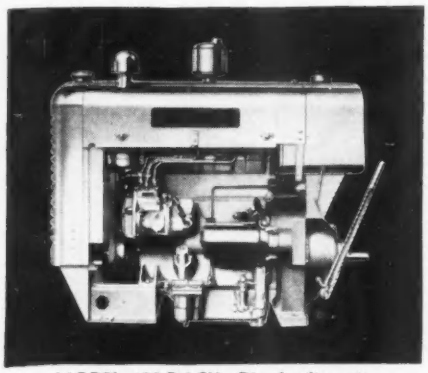
The companies—Anglo-Egyptian Oilfields, Ltd. (Royal Dutch-Shell) and Socony-Vacuum Oil Company—stated their intentions to continue production operations in the four proven fields now producing. This impasse dates back to the passage of the 1948 Mines and Quarries Law which contained numerous restrictions, the principal one being a requirement that production leases can be held only by Egyptian companies, meaning entities owned 51 percent by Egyptian nationals.

Proposed amendments drafted to this law in 1950 that would have established the minimum terms acceptable to the operating companies and early in 1952 two separate proposals amending the companies law were offered by cabinet officials. These were later sidetracked with the rise of nationalistic interest among political lead-

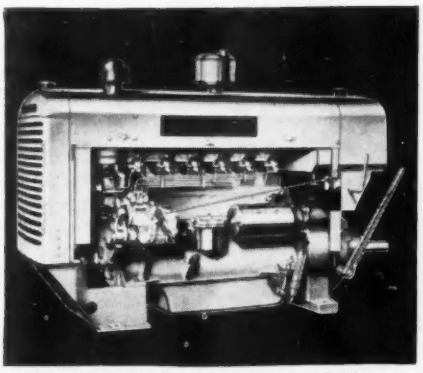
Drilling in Egypt

REGION and FIELD	WELLS COMPLETED IN 1951 Oil	Dry	TOTAL Wells	Footage	Wells Drilling End of 1951	WELLS COMPLETED IN 1950 Oil	Dry	TOTAL Wells	Footage
Asl	..	6	6	24,561	1	2	3	5	23,010
Hurghada	1	2	3	5,500	....	..	..	....	.....
Ras Gharib	2	..	2	4,973	1	6	..	6	13,784
Sudr	1	..	1	6,578	1	6	3	9	28,170
Total	4	8	12	41,612	3*	14	6	20	64,964

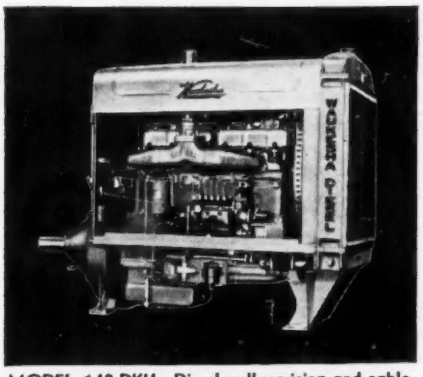
* All drilling operations were suspended at end of March, 1952.



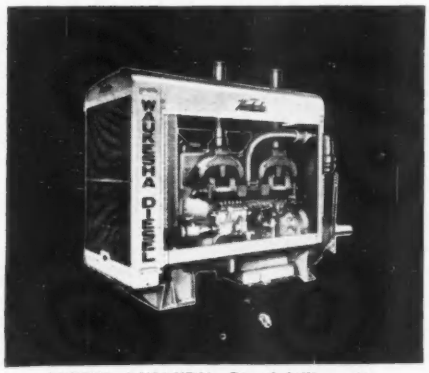
MODEL 180-DACU—Diesel utility unit; 12-27* hp.



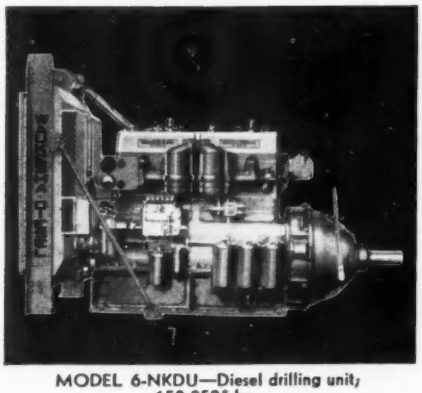
MODEL 190-DLCU—Diesel pumping and utility unit; 25-60* hp.



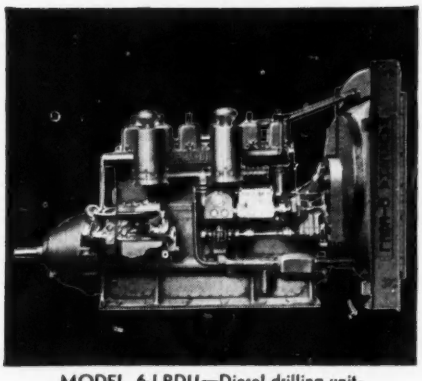
MODEL 148-DKU—Diesel well servicing and cable tool drilling unit; 86-150* hp.



MODEL 6-WAKDU—Diesel drilling unit; 121-190* hp.



MODEL 6-NKDU—Diesel drilling unit; 150-252* hp.



MODEL 6-LRDU—Diesel drilling unit; 240-333* hp.

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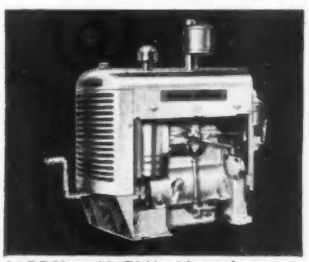
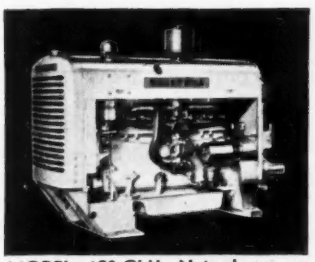


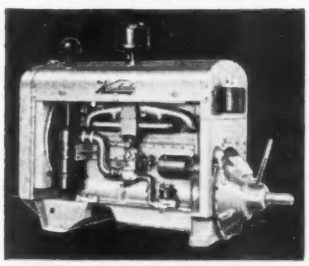
MODEL 180-GLU—Natural gas or gasoline utility unit; 20-32* hp.



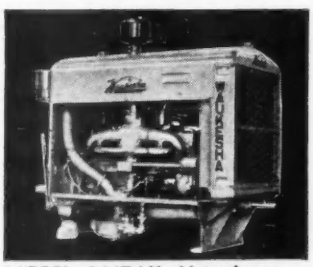
MODEL 190-GLU—Natural gas or gasoline pumping unit; 29-57* hp.

*Continuous Rating

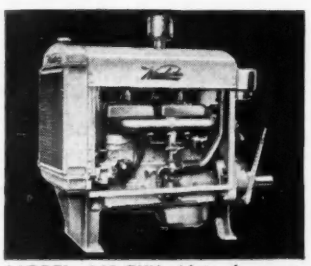
135-R



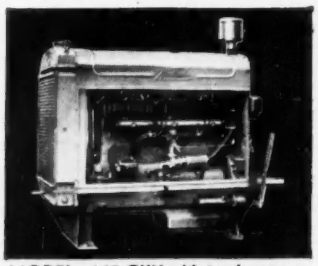
MODEL 195-GKU—Natural gas or gasoline pumping unit; 35-85* hp.



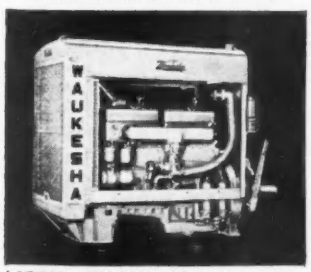
MODEL 6-MZAU—Natural gas or gasoline pumping unit; 40-72* hp.



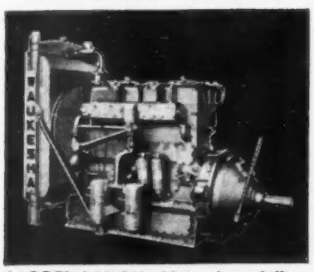
MODEL 140-GKU—Natural gas or gasoline servicing unit; 47-115* hp.



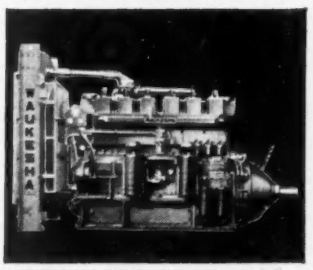
MODEL 145-GKU—Natural gas or gasoline servicing unit; 65-150* hp.



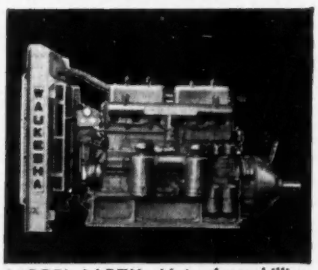
MODEL 6-WAKU—Natural gas servicing-drilling unit; 138-213* hp.



MODEL 6-NKRU—Natural gas drilling unit; 156-280* hp.



MODEL 6-LROU—Natural gas drilling unit; 244-375* hp.



MODEL 6-LRZU—Natural gas drilling unit; 311-435* hp.

ers directed at the British occupancy of the Suez Canal Zone and foreigners in the country in general.

Standard Oil Company of Egypt (Jersey Standard) abandoned its operations in Egypt early in 1949 after 12 years of exploratory effort and shortly after a discovery of oil on the Sinai Peninsula at Wady el Feirin.

Egypt's crude oil production comes from the Ras Gharib and Hurghada fields on the western side of the Gulf of Suez operated by Anglo-Egyptian, and the Asl and Sudr fields on the Sinai Peninsula operated by AEO and Socony-Vacuum jointly. An additional proven field on the Sinai Peninsula, Ras Matarma with three shut-in wells, was discovered shortly after the passage of the 1948 law prohibiting producing leases to other than Egyptian companies.

REFINERIES OF EGYPT

Raffiniere de Petrole da Gov. (Government): 9000-barrel-a-day distilling cracking refinery at Z Suez.

Anglo-Egyptian Oilfields, Ltd.: 38,000 barrels daily distilling-cracking-asphalt refinery at Suez.

Production, Producing Wells and Geological Data of Egypt

FIELD	Year of Discovery	PRODUCING WELLS END OF 1951			CRUDE OIL PRODUCTION (Barrels)				Gravity of Oil (API)	PRODUCING FORMATION			
		Flowing	Art Lift	Total	Daily End of 1951	Year 1950	Year 1951	Cumulative Through 1951		Kind	Geologic Age	Producing Depth (Feet)	Type of Structure
Asl[1]	1948	7	..	7	12,265	3,843,798	4,245,298	9,760,744	22	Limestone	Eocene	2870-3870	Anticline
Gemsa (Abnd.)[2]	1908	..	..	..	.....	.....	.....	1,442,098	41	Limestone	Miocene	400-2000	Anticline
Hurghada[2]	1913	..	24	24	745	271,406	300,986	37,745,668	22-30	Sand and Conglomerate	Cretaceous, Miocene	700-2500	Anticline
Ras Gharib[2]	1938	12	94	106	21,420	7,746,632	8,026,401	102,802,812	25-26	Sand and Limestone.	Cretaceous, Miocene	1200-2500	.....
Ras Matarma[2]	1948	..	..	..	.....	.....	.....	.....	20	Limestone	Mid-Miocene, Eocene	1940-3200	Anticline
Sudr[1]	1946	7	1	8	11,523	4,249,299	3,726,506	17,040,962	19-23	Sand and Limestone	Miocene, Eocene	1500-3100	Anticline
Total	....	26	119	145	45,953	16,111,135	16,299,191	168,792,284					

[1] Operators: Anglo-Egyptian Oilfields, Ltd. (Shell), 50%; Socony-Vacuum Oil Company, Inc., 50% [2] Operator: Anglo-Egyptian Oilfields, Ltd.

* Do not include shut-in as of Dec. 31, 1951, as follows: Asl, 2, Gemsa 1, Hurghada 3, Ras Gharib 24, Ras Matarma, 3, Sudr 9.

ETHIOPIA

SINCLAIR Petroleum Company commenced drilling early in 1952 of its second exploratory well at a site near the village of Galadi in the Ogaden Desert of Ogaden Province in the southeastern part of Ethiopia. The new location is approximately 45 miles west of the company's first well in Ethiopia, Gumbura 1. The initial test was commenced in 1949 after more than three years of extensive geophysical surveys and was abandoned as dry in May of 1950 at a total depth of 10,127 feet of a scheduled 15,000-foot test.

Despite the poor showing of its nearly six years of exploratory activities, Sinclair continued geological and geophysical surveys, including airborne magnetometer, seismograph and gravity meter parties, and shallow hole structure drilling during all of 1950 and 1951 prior to the selection of the second test well location. The company's exclusive concession made with Emperor Haile Selassie in 1946 for a 50-year term covers the entire 350,000-square-mile empire.

The Ogaden region, where most of the exploratory activities have been confined, is about the size of Kansas and is practically uninhabited except for scattered nomadic tribes. The only outlet to the nearest town, Dire Dawa, for personnel and equipment is by air or over nearly 500 miles of winding road through sand and bush country.

MOROCCO

Expanded Exploration and Drilling Program Leads To Discovery of New Field, Increased Production

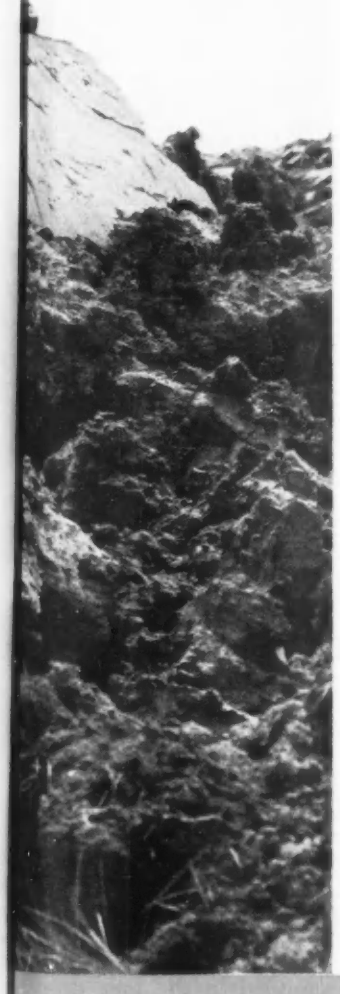
AN ENLARGED exploratory and development drilling campaign by Société Chérifienne des Pétroles in French Morocco led to the discovery of one new field and a sharp boost in crude oil production in 1951 to a total of 559,554 barrels, an increase of 264,099 barrels, or 92 percent, over 1950.

Total completions for the year was 100 new wells, of which 24 were oil producers, compared with 75 drilled in 1950 for 21 producers. The company drilled 42 wildcats in 1951, double the 21 exploratory tests of the previous year. Oil production at the end of the year was from 67 wells, of which 47 were flowing and 20 were on artificial lift.

Exploration activities in 1951 led to the discovery of the small new field of Mers el Kharez, situated southwest of the Sidi Fili field, a 1950 discovery, and east of the Oued Beth field, discovered in 1947. The new field produces 36 gravity crude from the Primary lime and sandstone at a maximum depth of 4400 feet, similar to the two nearby fields. At the end of the year, five flowing wells were on production in the Mers el Kharez field with a total daily average output of 390 barrels. One wildcat, the OR 2, near Petitjean, was drilled to a total depth of 13,782 feet.

Emphasis on development drilling was placed in the Oued Beth field, where 33 wells were completed, of which only one was a producer bringing the total flowing wells at the end of the year to 13. Rapid strides in developing the Sidi Fili field were made with the completion of 12 oil wells and two dry holes. Thirteen wells were producing in this field at the end of the year, all flowing, with

built to TAKE IT LONGER



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output averaging 844 barrels per day making it the largest field in Morocco.

A four-inch pipe line was to be constructed in 1952 between the Sidi Fili field and the 2200-barrel daily refinery at Petitjean, a distance of about 15 miles.

REFINERIES OF MOROCCO

Societe Cheriffienne des Petroleo: 2500-barrel-a-day topping refinery at Petitjean.

PIPE LINES OF MOROCCO

Societe Cheriffienne des Petroleo: 280-barrel daily, 1-mile, 2-inch crude line from Bou Draa to Petitjean.
280 barrels daily, 12.3-inch crude line from Tselfet to Petitjean.
150-barrel-per-day, 2.3, 2-inch crude line from Ain Hamra to a railway connection at Karia.
2500 barrels per day, 25-mile, 4-inch crude line from Sidi Fili to refinery at Petitjean projected.
2.66-mile, 2-inch natural gas line from Bou Draa to Petitjean (non-operating).

Drilling in Morocco

REGION and FIELD	WELLS COMPLETED IN 1951				Wells Drilling End of 1951	WELLS COMPLETED IN 1950			
	Oil	Dry	TOTAL Wells	TOTAL Footage		Oil	Dry	TOTAL Wells	TOTAL Footage
PLAINE DU RHARB:									
Ain Hamra	..	..	....	.....	....	5	1	6	5,000
Oued Beth	1	32	33	140,000	3	16	32	48	140,000
Sidi Fili	12	2	14	55,266	....	..	..	....	.....
Mers el Kharez	5	6	11	47,183	....	..	..	....	.....
Wildcats	6	36	42	167,300	2	..	21	21	117,800
Total	24	76	100	409,749	5	21	53	75	262,800

Morocco Oil Production and Geological Data

REGION and FIELD	Year of Discovery	PRODUCING WELLS, END OF 1951			CRUDE OIL PRODUCTION (Barrels)				Proved Area (Acres)	Gravity of Oil (API)	Formation, Name and Kind	Geologic Age	DEPTH (Ft.)		Avg. Thickness of Pay (Feet)	Type of Structure
		Flowing	Art. Lift	Total	Daily End of 1951	Year 1950	Year 1951	Cumulative Through 1951					Min. to Top of Pay	Max. to Bottom of Pay		
PLAINE DU RHARB:																
Ain Hamra	1918	..	15	15	20	9,140	10,500	87,640	300	45	Tortonian, Sand	Miocene	400	4500	10	Lenses
Bou Draa	1936	..	3	3	..	180	100	164,376	340	45	Toarcian, Lime	Liassic	600	2500	15	Anticline
Oued Beth	1947	13	..	13	405	213,812	142,318	591,200	150	35	Primary, Lime and Sandstone	Primaire	3280	3400	60	Faults
Oued Mellah	1948	16	..	16	150	66,200	68,105	135,605	250	35	Primary, Lime and Sandstone	Primaire	1800	n.a.	30	Faults
Sidi Fili	1950	13	..	13	844	2,419	289,323	291,800	n.a.	38	Primary, Lime and Sandstone	Primaire	n.a.	n.a.	n.a.	Faults
Tselfat	1934	..	2	2	11	3,704	4,008	157,600	130	45	Toarcian Domerian, Lime	Liassic	300	5500	40	Anticline
Mers el Kharez	1951	5	..	5	390	.....	45,200	45,200	n.a.	38	Primary, Sandstone and Lime	Primary	4400	4600	20	Fault
Total	....	47	20	67	1820	295,455	559,554	1,473,421	1170							

n.a.—Not available.

TUNISIA

EXPLORATORY operations preparatory to drilling continued in Tunisia during 1951 with one wildcat being spudded in late in the year. While a larger drilling program was planned for 1952, the realization of this exploratory effort will depend largely on the outcome of the political strife between France and Tunisian nationalists.

Under terms of concessions granted in 1950, a French-Tunisian government-controlled company, Societe d'Etudes et de Recherches Petrolieres en Tunisia (SEREPT), holds more than 10 million acres under license and has a 35 percent interest in two separate companies formed by subsidiaries of Gulf Oil Corporation and the Royal Dutch-Shell Group. SEREPT operates essentially in the Cap Bon region northeast of Tunis city and in the Chotts region west of Gabes. In the Cap Bon area, a new productive gas well was completed in the Lower Cretaceous horizons in 1951. SEREPT aims now at deepening the exploration through the Jurassic beds, where oil shows were obtained in 1950.

Cie. des Petroles de Tunisie, affiliated with Shell and SEREPT, holds concession rights in the Sahel area between Sousse and Kairouan. A first deep test was drilling in the Zeramdine structure, and had reached 6000 feet at year's end.

Societe Nord Africaine des Petroles (SNAP), owned by Gulf (65 percent) and SEREPT, has concession rights over 3.7 million acres in the region of Sfax. The company commenced drilling just prior to the rise of serious political difficulties in the country. SNAP continued geologic, gravity meter and seismic explorations in 1951. It was expected that a drilling location would be selected for the first test well on this concession by mid-1952.

OTHER AFRICA

MOZAMBIQUE Gulf Oil Company (Gulf Oil Corporation subsidiary), scheduled exploratory drilling to commence on its 47,000-square mile concession area in Mozambique about the middle of 1952. Certain indicated structural features were explored by core drilling during 1951 in the Inhambane-Inharrime area. The company has been conducting preliminary exploratory operations over the broad coastal plain of southern Mozambique, starting with an airborne magnetometer survey in 1949 and continued through 1950 and 1951 with geologic and gravity meter work. A seismograph party was at work early in 1952.

The Shell-D'Arcy Petroleum Development Company of Nigeria, Ltd., was formed in September, 1951, to conduct operations on behalf of the parent organizations (Shell Oil Company and Anglo-Iranian Oil Company) in West Africa. Shell-D'Arcy spudded in the first deep well ever drilled in Nigeria late in the year. Situated near Owerri, in the eastern part of the country, the well may be drilled to 10,000 feet.

Shell-D'Arcy has carried out some exploration work in about three-fourths of the 60,000-square-mile concession area.

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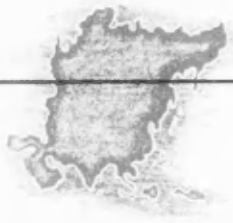


IRAN

Production Falls to 128,503,491 Barrels, 15 Percent Of Record 1950 Output, After Government Takes Over

AS THE result of Iran's decision to "nationalize" the properties of Anglo-Iranian Oil Company in 1951, crude oil production of the oldest producing nation in the Middle East last year declined to a total of 128,503,491 barrels, or slightly more than 53 percent of the 1950 record output of 241,425,000 barrels. Before its operations were halted by order of the government at the end of July, Anglo-Iranian had produced 122,948,000 barrels in Iran in 1951, and the remaining production in the final five months of the year was that of the government's company, National Iranian Oil Company. The total output for the year was the lowest since 1944.

Anglo-Iranian's forced exit from Iran after a half century of operations and 40 years of oil production came as a result of the Iranian's parliament vote under pressure of nationalist elements in April to cancel the 1933 concession agreement and to confiscate Anglo-Iranian's vast properties in the country valued at upwards of one-half billion dollars exclusive of crude oil reserves in the ground.

The nationalization action was the result of negotiations between the company and the government dating back to 1949 for a new supplemental agreement to the basic contract from which royalties, taxes and other payments to the government were computed. AIOC in mid-1949 offered with tentative approval of the Iranian government to increase its royalties from about 22 cents a barrel to 34 cents plus an additional eight cents in income and other taxes.

This offer would have amounted to the highest royalty then in effect in the Middle East and would have resulted in total payments by the company to the government in 1950 of $117.6 million instead of the $92.4 million actually paid in taxes and royalties based on the 1933 royalty and tax rate.

Rising nationalistic pressure starting late in 1949 prevented the supplemental agreement from coming to a vote in parliament. The nationalization order resulted. Following this move, negotiations by the company, the British Government, which owns 53 percent of AIOC and various U. S. Government officials failed to make any progress with the Iranian Government of Premier Mohammed Mossadegh, who came to power at the time of the vote by the lawmakers.

The chief basic stumbling block to any prospective settlement between AIOC and Iran has been the latter's insistence that any future contract must be within the framework of the nationalization law, which means the Iranian Government would own and operate the oil producing and refining properties and any concessionaire would be a contractor on a fee basis to the government.

REFINERIES OF IRAN

National Iranian Oil Company: 550,000-barrel-a-day skim-crack-asphalt refinery at Abadan.
2300-barrel daily skimming refinery at Kermanshah.

PIPE LINES OF IRAN

National Iranian Oil Company (these pipe lines were taken over from Anglo-Iranian Oil Company, Ltd., following nationalization of the industry):
230,000-barrel-a-day, 97-mile, 12-16-inch crude line from Agha Jari to Abadan.
230,000-barrel daily, 42-mile, 12-16-inch crude line from Agha Jari to Mashur.
170,000-barrels-a-day, 45-mile, 20-22-inch crude line from Agha Jari to Mashur.
45,000-barrel-per-day, 166-mile, 12-inch crude line from Gach Saran to Abadan.
220,000-barrel daily crude pipe line system, consisting of 136 miles of 12-inch from Haft Kel to Abadan, 124 miles of 12-inch from Haft Kel to Marid, and 61 miles of 12-inch from Haft Kel to Kut Abdullah.
32-mile, 10-12-inch crude line from Naft Safid to Wais.
80,000-barrel-a-day, 133-mile, 10-12-inch crude line from Masjid-i-Sulaiman to Abadan.

National Iranian Oil Company (these lines were taken over from Kermanshah Petroleum Company, Ltd., an Anglo-Iranian subsidiary, upon nationalization):
26,000-barrel daily, 40-mile, 8-10-12-inch crude line from Lali to Masjid-i-Sulaiman.
3200-barrels-a-day, 146-mile, 3-inch crude line from Naft-i-Shah to Kermanshah.

Note: These data are subject to possible revision on resumption of operations.

Drilling in Iran

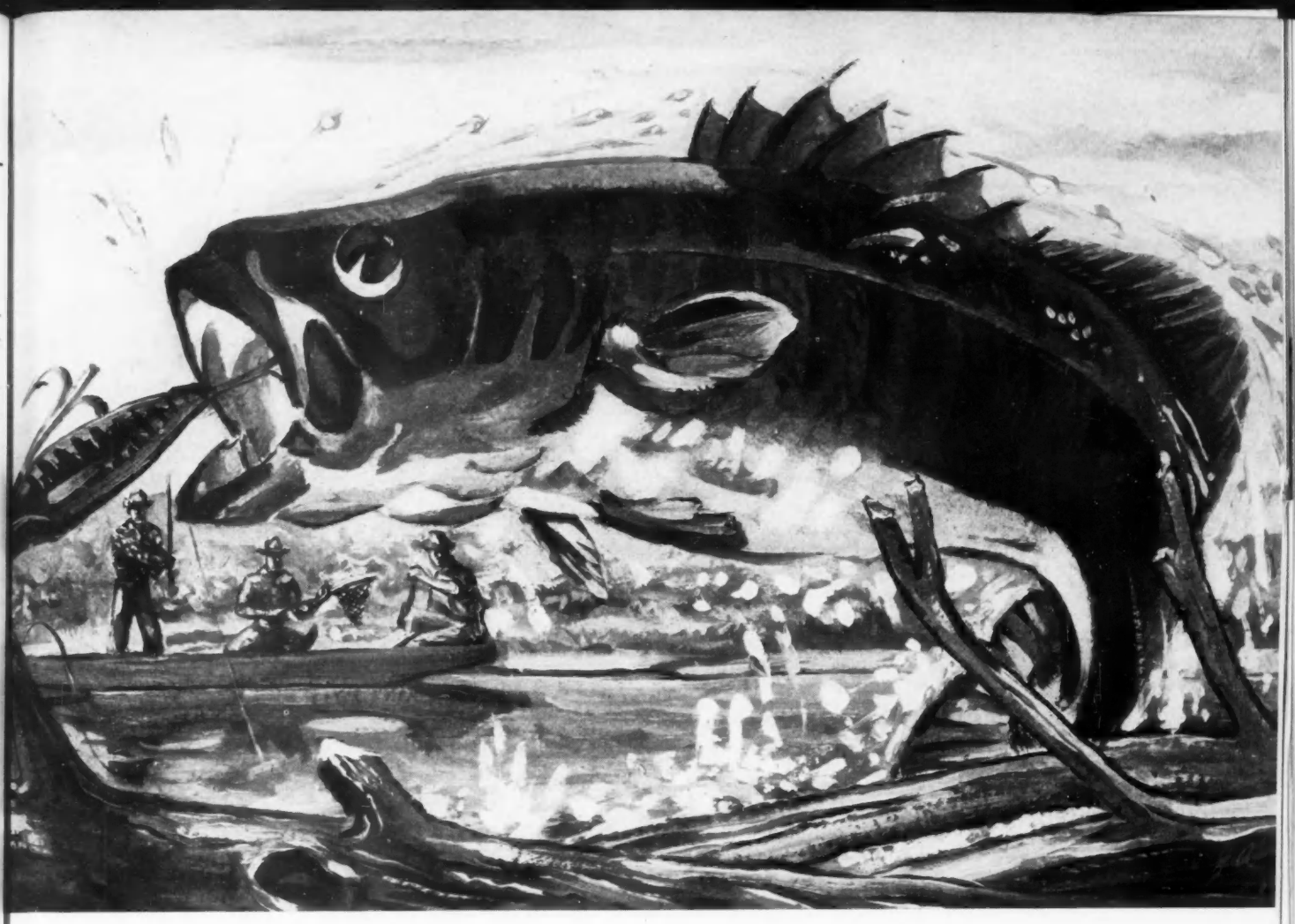
PROVINCE and FIELD	WELLS COMPLETED IN 1950				WELLS COMPLETED IN 1951			
	Oil	Dry	TOTAL Wells	TOTAL Footage	Oil	Dry	TOTAL Wells	TOTAL Footage
KHUZISTAN:								
Agha Jari	2	..	2	32,093	3	..	3	.....
Lali	1	..	1	20,226	1	1*	2	.....
Naft Safid	3	2	5	31,701	3	..	3	.....
Total	6	2	8	84,020	7	1	8	.....

* This dry hole was reported by National Iranian Oil Company. All other completions were made by Anglo-Iranian Oil Company prior to the end of July, 1951.

Iran Oil Production, Producing Wells and Geological Data

PROVINCE and FIELD	Year of Discovery	Max. Wells on Production in 1951	CRUDE OIL PRODUCTION (Barrels) Year 1950	Year 1951	Cumulative Through 1951	Est. Proven Area (Acres)	Gravity of Oil (API)	PRODUCING FORMATION Name	Kind	Age	Min. Depth to Top of Pay (Feet)	Max. to Bottom of Pay (Feet)	Avg. Thickness of Pay (Feet)	Type of Structure
FARS:														
Gach Saran	1928-37	4	15,403,000	9,803,856 (190,856)*	130,441,000	38,400	32.8	Asmari	Limestone	Olig.-Mio.	4000	7000	1500	Anticline
KERMANSHAH:														
Naft-i-Shah	1923	1	1,272,000	1,736,199 (798,199)*	14,946,000	3,840	42.8	Kalhur	Limestone	Olig.-Mio.	2600	2700	250	Anticline
KHUZISTAN:														
Agha Jari	1937-38	18	117,785,000	66,373,081 (2,823,081)*	431,631,000	28,400	35.8	Asmari	Limestone	Olig.-Mio.	6000	9000	600	Anticline
Haft Kel	1928	21	70,468,000	31,596,000 (0)*	1,000,077,000	28,800	39.0	Asmari	Limestone	Olig.-Mio.	3000	4000	900	Anticline
Lali	1938	4	5,563,000	3,304,754 (216,754)*	14,870,000	5,000	36.0	Asmari	Limestone	Olig.-Mio.	5000	7000	1200	Anticline
Masjid-Sulaiman	1908	32	21,753,000	11,614,505 (1,477,505)*	873,611,000	34,500	37.8	Asmari	Limestone	Olig.-Mio.	2000	3000	1000	Anticline
Naft Safid	1934-38	7	9,181,000	3,975,096 (49,096)*	34,984,000	15,400	35.4	Asmari	Limestone	Olig.-Mio.	5000	6000	900	Anticline
Pazanun (Condensate)	1937	..	.....	.....	6,500,000	6,400	..	Asmari	Limestone	Olig.-Mio.	6000	8000	700	Anticline
Total	.....	87	241,425,000	128,503,491 (15,555,491)*	2,507,060,000	160,740								

*Production for the year 1951 reflects that of Anglo-Iranian Oil Company, Ltd., through July and the volume reported by National Iranian Oil Company subsequent to "nationalization" of the industry. The latter is shown in parenthesis as reported to WORLD OIL by the government-operated company.



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IRAQ

16 Flowing Kirkuk Wells Average 166,000 Barrels Daily To Increase 1951 Production to 61,534,719 Barrels

CRUDE production in Iraq during 1951 of 61,534,719 barrels was an increase of 14,774,513 barrels from the previous year, and raised the national cumulative total to 529,564,797 barrels. Most of this production was produced in the vast Kirkuk field, where 16 flowing wells yielded 60,621,515 barrels—an average of approximately 166,000 barrels daily. Of Kirkuk's 61 wells, 29 are shut in and 16 are observation wells.

Trailing Iraq Petroleum Company's Kirkuk field in production was the Zubair field, operated by Basrah Petroleum Company, Ltd., an IPC affiliate. Seven of Zubair's 13 wells produced 913,204 barrels during 1951, raising the field's cumulative yield to 1,090,460 barrels, as compared to Kirkuk cumulative total of 528,474,337 barrels. Five wells are shut in at Zubair and one at Nahr Umr.

Available figures show proven acreage in Iraq of 99,100 acres, including 83,500 acres at Kirkuk; 3600 acres at Ain Zalah, operated by Mosul Petroleum Company, Ltd., an IPC affiliate; and 12,000 acres at Qaiyarah. While Ain Zalah field was discovered in 1940 and Qaiyarah field in 1927, neither was in production during 1951.

Iraq drilling in 1951 reflected an increase of 14,349 feet from 1950's total footage of 109,286 feet. But four fewer wells were drilled in 1951 than in the previous year, when 18 wells were completed.

Basrah's Zubair field led 1951 drilling with seven completions and total footage of 90,883 feet. All wells found oil. Kirkuk's six wells, all successfully completed, added 26,019 feet to its drilling total. One observation well was completed at Ain Zalah at a depth of 6733 feet. Seven wells were being drilled at the year's end—five at Zubair and two at Kirkuk.

In addition to the marked rise in crude production during 1951 resulting from the Iranian situation, Iraq's oil industry pointed to two additional highlights which were successfully completed in 1952 but whose progress during 1951 presaged the achievement of both objectives:

- The pipe line to Syria.
- The new profit-sharing agreement.

IPC's 556-mile, $120 million pipe line from Kirkuk to Banias, Syria, was completed in 1952, following a contract awarded to Arabian Bechtel Company in 1950. The line removed to a great extent IPC's restriction on Kirkuk production. The line's normal capacity is 275,000 barrels of crude daily.

The Iraq Parliament in February, 1952, finally ratified the 50-50 profit sharing agreement negotiated in August of 1951 with Iraq Petroleum and including the two subsidiaries of IPC, Mosul Petroleum and Basrah Petroleum. Parliament members of three of the five political parties composing the Iraqi Parliament opposed ratification.

Under the profit-sharing arrangement, IPC estimated Iraq would receive $86,800,000 during 1952, and by 1955 the government's share of the three companies' profits will amount to $168 million.

At the Fao terminal eight 100,000-barrel crude storage

Drilling Operations in Iraq

PROVINCE and FIELD	WELLS COMPLETED IN 1951			Wells Drilling End of 1951	WELLS COMPLETED IN 1950		
		TOTAL				TOTAL	
	Oil	Wells	Footage		Oil	Wells	Footage
BASRAH:							
Zubair	7	7	90,883	5	3	3	64,801
KIRKUK:							
Kirkuk	6	6	26,019	2	12	12	32,654
MOSUL:							
Ain Zalah	1*	1	6,733	....	3	3	11,831
Total	14	14	123,635	7	18	18	109,286

* Observation well.

Iraq Oil Production and Geological Data

PROVINCE and FIELD	Operating Company	Year of Discovery	Producing Oil Wells End of 1951			CRUDE OIL PRODUCTION (Barrels)				Proved Area (Acres)	Gravity of Oil (API)	Formation Name and Kind	Geologic Age	DEPTH (Feet)		Avg. Thickness of Pay (Feet)	Type of Structure
			Flowing	Art Lift	Total	Daily End of 1951	Year 1950	Year 1951	Cumulative Through 1951					Min. to Top of Pay	Max. to Bottom of Pay		
BASRAH:																	
Zubair	Basrah Pet. Co. Ltd.	1949	7	....	*13	....	.....	913,204	1,090,460	n.a.	n.a	Sandstone	Cretaceous	n.a.	n.a.	n.a.	Anticline
DIYALA:																	
Naft Khaneh	Khanaquin Oil Co. Ltd. (Anglo-Iranian)	....	..	..	..	..	.....	.....	.....	n.a.	42.8	Asmari, Limestone	Mio.-Eoc.	3000	n.a.	200-300	Anticline
KIRKUK:																	
Kirkuk	Iraq Pet. Co. Ltd.	1927	16	..	†61	n.a.	46,760,206	60,621,515	528,474,337	83,500	36	Quarah Chauq, Limestone	Mio.-Eoc.	950	3200	800	Closed Anticline
MOSUL:																	
Ain Zalah	Mosul Pet. Co.	1940	..	(Not Yet in Production)		.....	.....	.....	.....	3,600	32	Ain Zallah, Limestone	Cret. or Mio.	5000	6000	200	Closed Anticline
Qaiyarah	.....	1927	..	(Not Yet in Production)		.....	.....	.....	.....	12,000	20	Shallow Zone Main Limestone, Limestone	Miocene	700	1000	600	Anticline
Total	.....	....	23	..	74	..	46,760,206	61,534,719	529,564,797	99,100							

* Including five shut in at Zubair and one at Nahr Umr. † Including 20 producing wells shut in and 16 observation wells.

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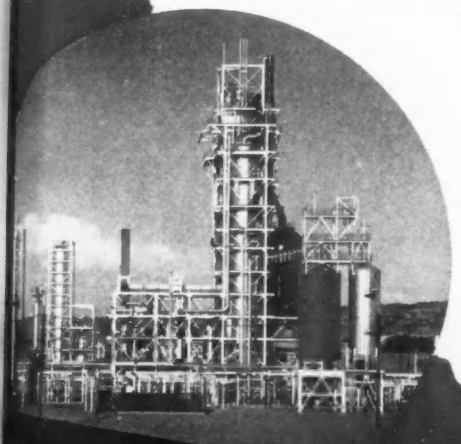

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FLUOR LITERATURE AVAILABLE

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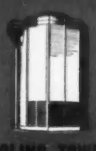

COOLING TOWERS

Fluor Cooling Towers were the first "engineered" cooling towers to be installed at Signal Hill, California in 1921. They are now in service throughout the world in virtually every industry utilizing water as a cooling medium.

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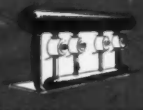

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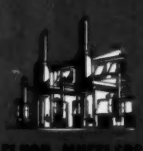

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tanks were erected. Two oil-loading jetties were built, each capable of loading tankers at the rate of almost 15,000 barrels an hour by means of electrically-driven pumps. Jetties are equipped for night loading.

The concession covering this part of Iraq was granted Basrah Petroleum in 1938, and exploration began immediately. Extensive geological surveys were completed in the Amara area before the outbreak of World War II. Basrah Petroleum and its associates obtained the first drilling rigs to be built after the war, and two of them began drilling in 1948, one at Zubair and the second at Nahr Umr. Later, a test at Ratawi was drilled. The Nahr Umr test found water and subsequent drilling was concentrated at Zubair.

REFINERIES OF IRAQ

Iraq Government: Refinery at Baiji planned.
Iraq Petroleum Co., Ltd. (Anglo-Iranian, Shell, Cie. Francaise de Petroles, Standard of New Jersey, Socony-Vacuum, C. I. Gulbenkian): 1500-barrel-a-day skimming refinery at Kirkuk.
2280-barrel daily skimming refinery at Kirkuk under construction.
1500 barrels daily skimming refinery at Haditha.
6450-barrel-per-day skimming refinery at Haditha.
Anglo-Iranian Oil Co., Ltd. (British Government, Burmah Oil Co.): 7500-barrel-a-day skimming refinery at Alwand.

PIPE LINES OF IRAQ

Iraq Petroleum Company (Anglo-Iranian, Shell, Cie. Francaise de Petroles, Standard of New Jersey, Socony-Vacuum, C. I. Gulbenkian): 160,000-barrel-a-day crude pipe line system consisting of 532 miles of 12¾-inch line and 532 miles of 16-inch loop. Of each line, approximately 250 miles is in Iraq, 262 miles in Syria and 20 miles in Lebanon.
275,000 barrels daily (314,000-barrel ultimate maximum), 556-mile, 26-30-32-inch crude line from Kirkuk field to Banias, Syria. Approximately 250 miles is situated in Iraq, 306 miles in Syria.
140,000-barrels-per-day, 620-mile, 12¾-inch crude line and a 620-mile, 16-inch loop from Kirkuk to Haifa, Israel. Operations suspended due to political reasons. Construction of 16-inch loop incomplete. Approximately 367 miles is situated in Iraq, 216 miles in Transjordan, 37 miles in Israel.
Khanaqin Petroleum Co. (Anglo-Iranian Oil Co., Ltd.): 10,000-barrel-a-day crude pipe line system from Naft H Khanch field to Khanaqin consisting of 12 miles of 4-inch and 12-mile, 4-inch loop.
Basrah Petroleum Company, Ltd. (Iraq Petroleum Company): 52,000-barrel-a-day, 75-mile, 12-16-inch, in series, crude line from Zubair field to Fao.
Mosul Petroleum Company, Ltd. (Iraq Petroleum Company): 27,000-barrel daily, 136-mile, 12¾-inch crude line from Ain Zalah field to IPC lines near Shuraimiya.

KUWAIT

Burgan Field Gives Area Distinction of Being The Fastest Growing Oil Producer in Mid-East

CRUDE oil production from Kuwait was increased 63 percent to a total of 205,127,466 barrels in 1951 from 125,917,898 in the previous year. Production in the tiny sheikdom at the head of the Persian Gulf has had the most rapid rise of any area in the Middle East. Discovered in 1938 and first becoming a commercial oil producer in mid-1946, output in Kuwait still comes from a single field—the fabulous Burgan, where recoverable reserves are estimated at upwards of 16 billion barrels, or nearly 16 percent of the world's total.

A new discovery in Kuwait at Magwa, seven miles north of the Burgan field, in late 1951 and early 1952 is expected to add substantially to production and reserves.

Operations in Kuwait in 1951 were highlighted by two developments: The rapid increase in production during the year to meet required output to offset the loss of Iranian crude oil, and the signing near the end of the year of a new income tax-royalty agreement by Kuwait Oil Company, Ltd., with the Sheik of Kuwait for a 50-50 sharing of profits. This is similar to the equal sharing pattern first established in the Middle East by Arabian American Oil Company effective to Jan. 1, 1950, and technically is the result of an income tax decree promulgated by the Sheik on Dec. 1, 1951, applicable to foreign oil companies operating in Kuwait. KOC is the sole concessionaire of the 6000-square-mile sheikdom.

Crude production, which averages 390,000 barrels daily in the first quarter and 456,000 barrels a day in the second quarter of 1951, was sharply boosted to a peak of 708,240 barrels per day in October following termination of the Anglo-Iranian Oil Company operations in Iran at the end of July. Daily output at the end of the year was 700,000 barrels with early 1952 production just slightly under that level.

Exploratory activities in Kuwait in 1951 included the completion of Magwa 1 which encountered production in the Burgan sands, seven miles north of the Burgan field.

REFINERIES OF KUWAIT

Kuwait Oil Company (Gulf Exploration Company, Anglo-Iranian Oil Company): 27,500-barrel-a-day topping-refractionating unit at Mina al Ahmadi.

PIPE LINES OF KUWAIT

Kuwait Oil Company (Gulf Exploration Company, Anglo-Iranian Oil Company):
390,000-barrel daily, 9-mile, 20-22-inch crude line from Burgan to Ahmadi.
Two 20-inch, 9-mile crude lines from Burgan to Ahmadi with capacity of 660,000 barrels per day.
Crude pipe line system from Ahmadi to Mina al Ahmadi, a distance of 5.72 miles, consisting of two 22-inch lines and three 24-inch lines with combined capacity of 800,000 barrels a day.
250,000 barrels daily, 10.5-miles, 16-inch crude line from Magwa field to Ahmadi proposed.
Three 30-34-inch, 5.72-mile crude lines from Ahmadi to Mina al Ahmadi projected.
1000 barrels per day, 27-mile, 3-4-inch products line from Mina al Ahmadi to Kuwait town.
7 Mmcf, 10-mile, 12-inch gas line from Burgan field to Ahmadi.
5½ Mmcf, 6-mile, 10-inch gas line from Ahmadi to Mina al Ahmadi.
Kuwait State: 4 Mmcf, 30 mile, 8-inch gas line from Burgan to Kuwait town.

Drilling In Kuwait

STATE and FIELD	WELLS COMPLETED IN 1951 Oil	Dry	TOTAL Wells	TOTAL Footage	Wells Drilling End of 1951	WELLS COMPLETED IN 1950 Oil	TOTAL Wells	TOTAL Footage
KUWAIT:								
Burgan Field	19	9	19	79,590	3	13	13	61,188
Wildcats	1	1	2	10,395	..	..	..	.....
Total	20	1	21	89,985	3	13	13	61,188

Oil Production, Producing Wells and Geological Data in Kuwait

Field and Location	Operating Company	Year of Discovery	Producing Oil Wells End of 1951 Flowing	Total	CRUDE OIL PRODUCTION (Barrels) Daily at End of 1951	Year 1950	Year 1951	Cumulative Through 1951	Proved Area (Acres)	Gravity of Oil (API)	Formation, Name and Kind	Geologic Age	DEPTH (Feet) Min. to Top of Pay	Max. to Bottom of Pay	Thickness of Pay (Feet)	Type of Structure
Burgan	Kuwait Oil Co., Ltd.	1938	118	118	700,000	125,917,898	205,127,466	490,200,156	n.a.	32.5	Burgan series Sandstone	Middle Cretaceous	3560	4772	n.a.	Anticline

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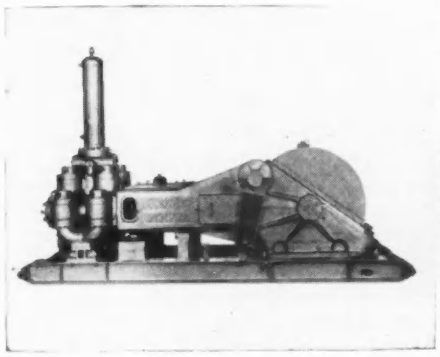
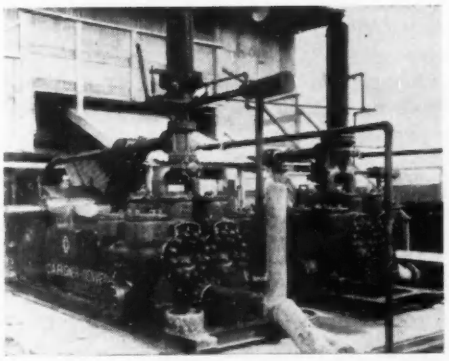
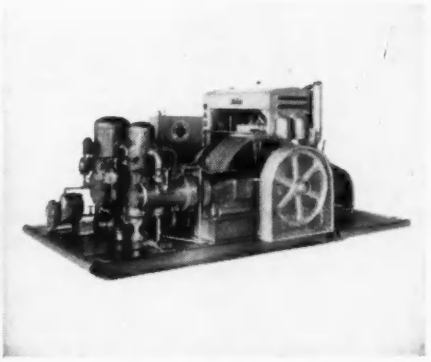


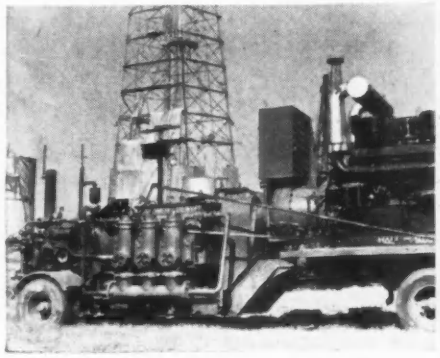
Gardner-Denver 7½ x 18 GXR Power Slush Pump



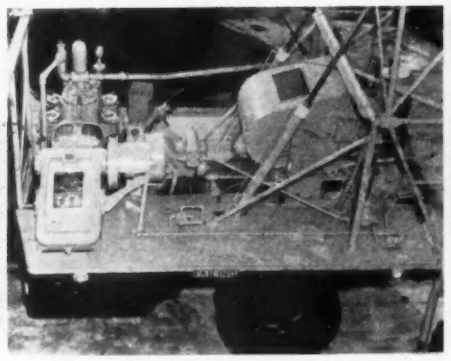
Gardner-Denver 7¾ x 16 FXQ Power Slush Pump



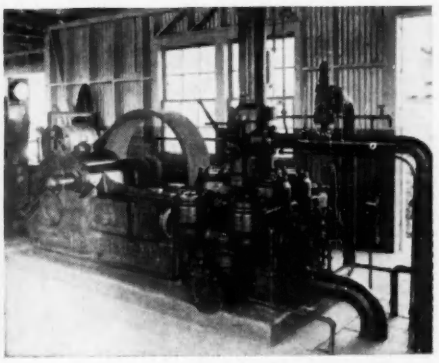
Gardner-Denver 2-Stage Gas Booster Compressor



Gardner-Denver PL7 Cementing Pump



Gardner-Denver 4½ x 6 FX Power Pump on Seismograph Rig



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NEUTRAL ZONE

Geophysical Survey of Entire Concession Area Pushed; Structure Drilling Program Undertaken

ACTIVE exploration in the Neutral Zone which lies between Kuwait and Saudi Arabia continued throughout the year 1951. American Independent Oil Company, which holds its concession from the ruler of Kuwait, carried on operations in behalf of itself and Pacific Western Oil Corporation, the concessionaire of King Ibn Saud of Saudi Arabia.

Major activities during 1951 were directed toward the completion of a comprehensive geophysical survey of the entire concession area, with two land seismic parties working all year and a third during first half of the year.

At the same time, a program of structure drilling was undertaken in selected areas where seismic results suggested features of interest. During the last quarter of the year, the seismographic survey activity was extended to the territorial waters of the Neutral Zone and to three Kuwait Islands situated in the Persian Gulf. The territorial waters and islands are held exclusively by American Independent under a concession from the Shaikh of Kuwait.

QUATAR

Production Jumped More Than 36 Percent to Help Make Up Loss Caused by Iranian Nationalization

CRUDE output in Qatar during 1951 increased slightly more than 36 percent above 1950 production—from 11,457,000 barrels in 1950 to 18,097,976 barrels last year, or a 6,640,976-barrel increase.

Iranian nationalization influenced Qatar's oil yield to a wide extent as the nation increased its output to help make up for the erasing from the world market of 700,000 barrels a year of Iranian crude.

All Qatar oil was produced from the Dukhan field, which was discovered in 1940. Out of a total of 21 wells, only 16 flowing wells were in operation. Three wells were shut in and two were observation wells. These 16 wells were producing 58,000 barrels of crude daily at the end of the year. Qatar's cumulative production reached 31,409,061 barrels of 40 gravity oil through December 31.

PIPE LINES OF QATAR

Petroleum Development Co. (Qatar) Ltd. (Iraq Petroleum Co., Ltd.): 60,000-barrel-a-day (100,000-barrel daily maximum), 69.7-mile crude line from Dukhan to Umm Said, consisting of 17.9 miles of 12¾-inch line and 51.8 miles of 14½-inch line.

Drilling Operations in Qatar

STATE and FIELD	WELLS COMPLETED IN 1951					Wells Drilling End of 1951	WELLS COMPLETED IN 1950				
				TOTAL						TOTAL	
	Oil	Gas	Dry	Wells	Footage		Oil	Gas	Dry	Wells	Footage
Sheikhdom of Qatar, Dukhan Field	5	..	..	*6	44,173	3	..	..	..	.....	.....

* Including one observation well.

Qatar Oil Production, Producing Wells and Geological Data

Field and Location	Operating Company	Year of Discovery	Producing Oil Wells End of 1951		CRUDE OIL PRODUCTION (Barrels)				Proved Area (Acres)	Range of Gravity (API)	Name	Kind	Geologic Age	Min. to Top of Pay	Max. to Bottom of Pay	Average Thickness of Pay (Feet)	Type of Structure
			Flowing	Total	Daily at End of 1951	Year 1950	Year 1951	Cumulative Through 1951									
Dukhan	Petroleum Development (Qatar) Ltd. (Trag Petroleum Co., Ltd.)	1940	16	*21	58,000	11,457,000	18,097,976	31,409,061	n.a.	40	Zekrit	Limestone	Jurassic	5100	n.a.	n.a.	Anticline

* Includes 3 shut in and 2 observation wells.

SAUDI ARABIA—BAHRAIN

277,692,605-Barrel Total Makes Country Top-Ranking Middle-East Producer and Fourth Largest in World

SAUDI ARABIA with a 39.2 percent increase in oil output in 1951 moved up to become the leading producing nation of the Middle East and the fourth largest in the world after the U. S., Venezuela and Russia. Arabian American Oil Company, which holds exclusive concession to oil production in the country, advanced in rank to become the world's largest crude producing company during the year.

Total crude oil production during 1951 was 277,962,605 barrels, an increase of more than 78.4 million barrels over the preceding 12-month period. Daily average output in Saudi Arabia was 761,541 barrels in 1951, compared with an average of 547,000 in 1950. Following the loss of Iranian output in mid-1951, Saudi Arabia's production reached a peak of 896,675 barrels daily in November. Early in 1952 daily average production was continuing at a rate in excess of 855,000 barrels.

Arabian American (Aramco), which is owned 30 percent each by The Texas Company, Standard Oil Company of California and Standard Oil Company (N. J.), and 10 percent by Socony-Vacuum Oil Company, had

its largest and most successful drilling campaign during the year. Thirty-two wells were completed in 1951, compared with 21 in 1950 and 24 in 1948, the previous peak year. Of the total drilled last year for a record footage of 215,779 feet, 31 were oil producers and one was an observation well.

Two new fields were discovered during the year, the first since 1949. The year's operations resulted in the largest annual extension to date in known estimated proven acreage, an increase of 114,200 acres to make a total of 312,800 acres in Saudi Arabia estimated to be proven to oil production.

At the end of the year, nine drilling rigs were in operation; three of which were on development drilling and the remainder on exploratory locations. During 1952, Aramco plans to maintain nine rigs in continuous operation.

Saudi Arabia's most important discovery of the year was the Uthmaniya field, brought in during April, about 40 miles south of the Ain Dar field. This field had not been placed on production by early 1952 due to lack of pipe line outlet, but a 30- and 31-inch gathering line to connect the new producer has been planned. Seven wells were completed in the field in 1951 with three additional wells drilling at the close of the year.

The Safaniya field, discovered in May, has four completed wells at the end of the year with one additional well drilling, though this field also has not been tied in to pipe line connections. The Safaniya field is Aramco's first offshore drilling in the Persian Gulf, located about 12,000 feet off the mainland and in approximately 20 feet of water.

Saudi Arabia's crude oil production at the end of 1951 came from 118 wells, an increase of 23 over the producers a year earlier, from four of the nation's nine known fields. Abqaiq, the largest producing field which accounts for two-thirds of the nation's total output, had 62 wells producing at the end of the year. During 1951, Abqaiq accounted for 183,804,383 barrels of oil, an increase of 21,330,541 barrels over 1950.

The Ain Dar field, a 1948 discovery that was first placed on production in 1951 with completion of a pipe line outlet, produced 56,192,277 barrels from 20 wells on production at the end of the year. This field had the largest development last year with 18 well completions and five additional drilling at the close of 1951. The Damman field, the first discovered in Saudi Arabia, accounted for 31,066,568 barrels of oil in 1951, or nearly 2.7 million barrels less than in 1950.

The remaining producing field, Qatif, produced 6,899,377 barrels, or 2.6 million barrels more than in 1950. At the close of the year, the Abu Hadriya, Fadhili and Haradh fields, in addition to the two 1951 discoveries, were closed in to production.

In contrast to all other areas of the Middle East, operations in Saudi Arabia in 1951 were not threatened with disruption by internal political conditions, due primarily to the bold step taken by Aramco late in 1950 to sign with King Ibn Saud's government a new agreement (retroactive to Jan. 1, 1950) providing that Saudi Arabia each year will receive in royalties, income taxes and other levies an amount equal to the company's net income after U. S. income taxes. A further important step in its relations with the Saudi Arabian government came at the start of 1952 with the company transferring its headquarters office from New York to Dhahran.

During 1951, its first full year of operation, Trans-Arabian Pipe Line Company delivered approximately 107,500,000 barrels of crude oil through its 1068-mile trunk line from the Persian Gulf to Sidon, Lebanon. A total of 920 ships lifted cargoes of crude at Sidon in 1951 from Tapline's terminals on the eastern Mediterranean, which moved the fields of Saudi Arabia 3500 miles nearer the markets of Western Europe.

The pipe line system of Saudi Arabia was further expanded in 1951 to add 47 miles of new crude lines with 278,000 barrels of daily crude delivery capacity. The crude charging capacity of Aramco's Ras Tanura refinery was increased during the year to 160,000 barrels daily from 140,000 barrels.

Bahrain* Island's crude oil production handled by Bahrein* Petroleum Company, Ltd., a jointly-owned subsidiary of Standard Oil Company of California and The Texas Company, amounted to 10,994,344 barrels, a slight decrease from the 1950 total. All production on Bahrain comes from a single field, the Bahrain, completed in 1932.

At the close of the year, production in this field was from 72 wells, an increase of three over a year previously. Drilling during the year resulted in eight well completions, of which two were dry and the remainder oil producers. This compared with four completions in 1950, all of which were oil wells.

* The island is spelled Bahrain. The spelling of the operating company is Bahrein.

Drilling in Saudi Arabia and Bahrain

COUNTRY and FIELD	WELLS COMPLETED IN 1950				WELLS COMPLETED IN 1951				Wells Drilling End of 1951
			TOTAL				TOTAL		
	Oil	Dry	Wells	Footage	Oil	Dry	Wells	Footage	
SAUDI ARABIA:									
Abqaiq	7	..	7	50,693	..	..	..	..	....
Ain Dar	6	1†	7	50,421	18	..	18	128,545	5
Abu Hadriya	..	..	..	..	..	1†	1	3,371	....
Dammam	1	..	1	884	1	..	1	4,749	....
Haradh	3	..	3	19,504	1	..	1	6,752	....
Qatif	2	1†	3	22,109	..	..	..	..	....
'Uthmaniyah	..	..	..	..	7	..	7	48,043	3
Safaniya	..	..	..	..	4	..	4	24,319	1
Total	19	2	21	143,647	31	1	32	215,779	9
BAHRAIN:									
Bahrain	4	..	4	9,711	6	2	8	20,430	1

† Abandoned well. * Observation well.

PIPE LINES OF SAUDI ARABIA AND BAHREIN

Arabian American Oil Company (Standard Oil Company of California, Standard Oil Company of New Jersey, The Texas Company, Socony-Vacuum Oil Company):

240,000-barrel-a-day, 6.3mile, 22-inch crude transfer line at Abqaiq.
105,000 barrels per day, 40-mile, 14-inch crude line from Abqaiq to Dhahran.
100,000-barrel daily, 38.5-mile, 12-14-inch crude line from Abqaiq to Dhahran.
460,000-barrel-per-day, 44.7-mile, 30-inch crude line from Abqaiq to Qatif Junction.
160,000-barrel daily, 28.2-mile, 20-22-24-inch crude line from Ain Dar to Abqaiq.
65,000 barrels daily, 35-mile, 10-inch crude line from Dhahran to Ras Tanura.
123,000-barrel daily, 23-mile, 12-14-inch crude line from Dhahran to Ras Tanura.
125,000-barrel per day system from Dharan to Bahrein consisting of one 12-inch and one 12-14-inch line 23.6 miles in length. Bahrein Petroleum owns half interest in the lines.
300,000 barrels a day, 269-mile, 30-31-inch crude line from Qatif Junction to to Qaisumah.
190,000-barrel-per-day, 18-mile, 20-22-inch crude line from Qatif Junction to Ras Tanura.
198,000-barrel-a-day, 29-mile, 20-22-inch crude line from Abqaiq to Qatif Junction.
80,000 barrels daily, 18-mile, 12-inch crude line from Qatif Junction to Ras Tanura.
300,000-barrel daily, 44.7-mile, 30-inch Qatif Junction line.

SAUDI ARABIA—BAHRAIN—Continued

190,000 barrels per day, 28.5-mile, 20-22-inch crude line from Buqqa to Qatif under construction.

130,000-barrel-per-day, 7.4-mile, 12-inch crude line from Buqqa to Ain Dar.

Trans-Arabian Pipe Line Company: 319,000-barrel-a-day, 754-mile, 30-31-inch crude line from Qaisumah to Sidon, Lebanon.

Bahrein Petroleum Company (Standard Oil of California and The Texas Company): 129,000-barrel-a-day, two 12-inch, 10.5-mile lines from Budaiya to Bahrain.

REFINERIES OF SAUDI ARABIA AND BAHRAIN

Arabian American Oil Company (Standard Oil Company of California, Standard Oil Company of New Jersey, The Texas Company, Socony-Vacuum Oil Company): 160,000-barrel-a-day crude still reforming-asphalt refinery at Ras Tanura, Saudi Arabia.

Bahrein Petroleum Company (Standard Oil Company of California, The Texas Company): 155,000 barrels daily complete, except lube-wax, refinery at Bahrain.

Saudi Arabia and Bahrain Oil Production and Geological Data

COUNTRY and FIELD	Year of Discovery	Producing Wells End of 1951	CRUDE OIL PRODUCTION (Barrels) Daily End of 1951	Year 1951	Year 1950	Cumulative Through 1951	Estimated Proven Area (Acres)	Gravity of Oil (API)	Formation, Name and Kind	Geologic Age	Average Depth to Pay (Feet)	Average Thickness to Pay (Feet)	Type of Structure
SAUDI ARABIA:													
Abqaiq	1941	62	503,574	183,804,383	161,573,842	667,374,038	86,400	38	Arab, Lime	Jurassic	6809	245	Anticline
Ain Dar	1948	20	153,951	56,192,277	.....	56,192,277	81,800	35	Arab, Lime	Jurassic	7128	162	Anticline
Abu Hadriya	1940	....	.....	.....	.....	9,579	n.a.	36	Hadriya, Lime	Jurassic	10220	120	.....
Dammam	1936	30*	85,114	31,066,568	33,730,873	251,237,421	9,100	35	Bahrein, Sand	Cretaceous	2627	....	Faulted
									Arab, Lime	Jurassic	4848	400	Dome
Fadhili	1949	....	.....	.....	.....	.....	7,900	38	Fadhili, Lime	Jurassic	9843	179	.....
Haradh	1949	....	.....	.....	.....	.....	41,400	34	Arab, Lime	Jurassic	6539	250	Anticline
Qatif	1945	6	18,902	6,899,377	4,241,963	21,755,781	21,300	35	Arab, Lime	Jurassic	7351	207	Anticline
'Uthmaniya	1951	....	.....	.....	.....	.....	45,300	34	Arab, Lime	Jurassic	6863	261	Anticline
Safaniya	1951	....	.....	.....	.....	.....	19,600	27	Bahrein, Sand	Cretaceous	5535	435	Anticline
Total	....	118	761,541	277,962,605	199,546,678	996,569,096							
BAHRAIN:													
Bahrain	1932	72	30,000	10,994,344	11,015,711	131,903,610	10,000	33.5	Bahrein, Lime	Cretaceous	2000	209	Anticline

* Includes two producing gas wells.

Note: Fields in Saudi Arabia operated by Arabian-American Oil Company. Bahrain fields operated by Bahrain Petroleum Company, Ltd.

TURKEY

IN AN EFFORT to overcome its small crude production, Turkey's Mining Research and Exploration Institute (MTA), the government operating agency, engaged in both field development and exploratory drilling during 1951. The nation's oil output, heretofore restricted for lack of refining installations and suitable pipe lines, is expected to rise with the completion in 1952 of a refinery and a new pipe line.

During 1950, Turkey's single major oil field, Ramandag in the Siirt Province, produced approximtely 500 barrels a day. In 1951, the production remained at approximately that level.

At Ramandag, MTA drilled well 16 deeper than its previous producing pay in the first horizon. However, lost circulation at 9775 feet forced abandonment of the well.

North of Ramandag, Garzan field was drilled during 1950-51. The first well was productive. MTA is currently drilling the second well. During 1951, MTA continued drilling in southern Turkey, near Iskenderun, despite failure of two wildcats which reached the Congen structure.

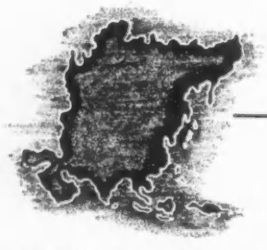
A test well was drilled in the Adana region during the year. Near the Gulf of Iskenderun, Adana has attracted geological interest for a long time. MTA has been studying the sector for several years. The test well was completed as a dry hole early in 1952 after a depth of 9840 feet was reached.

The government is erecting a 5000-barrel-daily refinery at Batman, the railhead of Ramandag, and has programmed 26 miles of 6-inch pipe line. This refinery and pipe line are expected to lead to additional drilling activities in the area.

Early in 1952, two unconfirmed reports from Turkey government officials indicated that some shows of oil may have been made in the Adalar District at a depth of approximately 6000 feet. Additional reports said "encouraging" shows of crude had been found in the Harran Plateau region along the Turkish and Syrian borders.

While no new laws were acted upon during 1951 and no concessions were granted, reports indicated that the Turkish government early in 1952 prepared a draft of a law providing that foreign capital would be allowed to participate in the exploitation of the nation's petroleum resources.

Turkey's proven crude reserves as of January 1, 1952, were put at 65 million barrels.

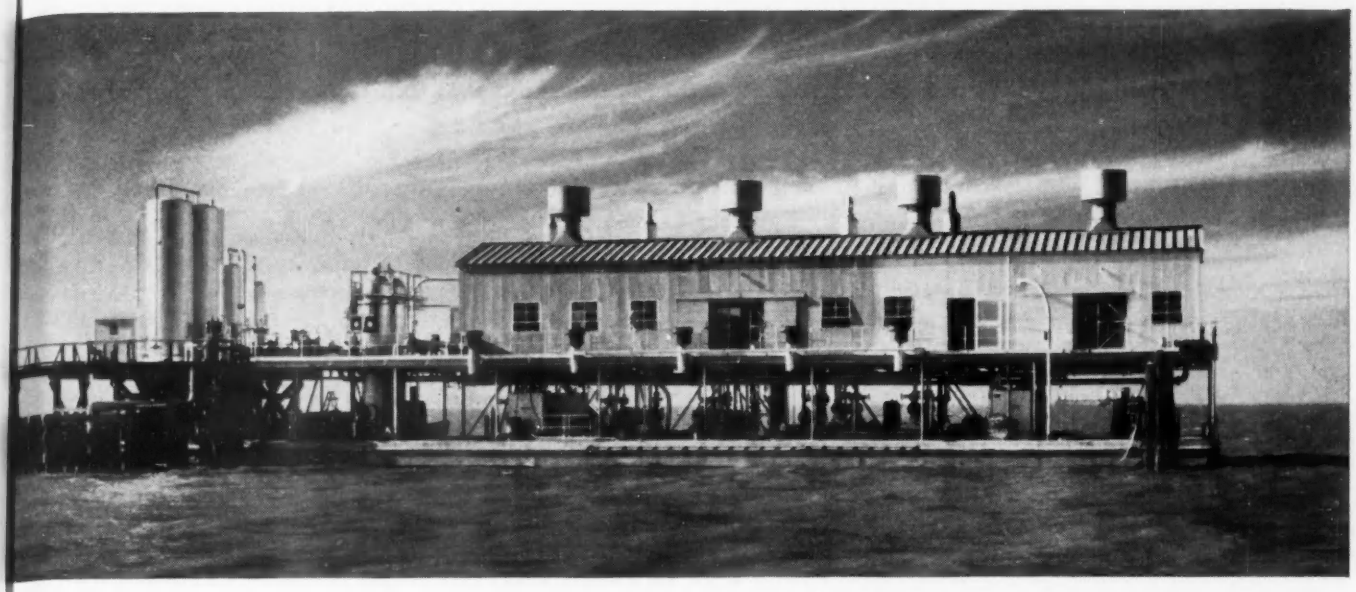


BURMA

Production from Chauk and Lanywa Fields Increased; Government Considering Pact with British Companies

CRUDE production from Burma's Chauk and Lanywa oilfields amounted to 644,941 barrels during 1951—almost double the previous year's output. In view of continuing internal strife, certain parts of Chauk field were inoperable during the year. Unsettled conditions at Yenangyaung, Indaw, Yenangyat and in the greater part of Minbu oilfield prevented further activity there. The only reliable transportation between the oilfields and Rangoon was by air.

The Iranian controversy resulted in supply problems for a period, but alternate sources of crude supplies were found and no products shortages existed, except avia-



fill this tough Oil's new compressor barge

In Grand Bay, five miles off Louisiana's shores, lies Gulf Oil Corporation's new compressor barge. This floating compressor station, and two others soon to be placed in service, will eliminate gas flaring in five separate Louisiana fields, with the gas being pumped into transmission lines.

The five Clark Midget Angle Compressors aboard represent fulfillment of one of the toughest compressor assignments imaginable. The barge had to be designed to ride out hurricanes, and it was expected that heavy seas would keep its deck awash during these periods of bad weather. This meant that the compressors had to be mounted on steel framework high above deck. The perfect balance of Clark Midget Angles made this feasible and five Clark MA-8, 300 bhp, gas-engine-driven compressors were installed — Gulf Oil's assurance of vibrationless performance.

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tion gasoline. Plane fuel was rationed for a while. But supplies grew plentiful toward the close of the year.

The proposal of the Burma government to enter into a joint venture with the three British operating companies in the reconstruction effort was discussed during the year. A draft of the government-oil company agreement was initialed December 1, subject to the government's acceptance after an inspection of the companies' valuation of the assets to be contributed by them to the proposed joint venture. The valuation amounted to approximately $40 million. Government inspection teams are expected to complete their survey in 1952.

The three British companies are Burmah Oil Company, Indo-Burma Petroleum Company, and British Burmah Petroleum Company, which own and operate the Central Burma oilfields jointly as Oil Concessions, Ltd.

Chauk field officials posted field security measures in 1951 following an effort by Communist agents to lead Chauk's 1000 oil workers into a strike. A large portion of Burmese oil workers want to nationalize their country's oil fields and installations. They approved a resolution demanding this action during the year.

Burmah Oil announced that several new wells were scheduled to be drilled in November at Chauk. A BOC geologist was supervising the oil field operations for the program which included deepening of some existing wells.

All Chauk-produced crude in recent years has been obtained from Burmah Oil's prewar wells in the rehabilitated field. During the latter part of 1951, production from those wells reached approximately 2000 barrels a day, for a postwar record.

At year's end oil was being produced at a rate of about 2000 barrels daily. But the output from the present area was beginning to slacken. The new drilling and deepening operations were aimed at making up the decline and insuring a ready supply of crude to the Chauk refinery.

Burma Prime Minister Thakin Nu inaugurated the new drilling program at Chauk November 8 when he spudded in the first few feet on the first well to be drilled since the war.

Plagued by continuing smuggling of oil to Communist China, Burma set up border patrols during the year to prevent the movement of oil crude across the border.

CHINA

Production Slips to Estimated 728,000 Barrels for Year; Communist Nation Suffers from Embargoes on Oil Exports

RED-CLOAKED China's crude production slipped slightly during 1951, despite Communist claims of new discoveries. Estimates pegged Chinese output at 728,000 barrels for the year, down approximately 2000 barrels from the previous year. This 3 percent drop was reflected in a daily average production decrease of five barrels from 1950's 2000 barrels a day. Cumulative production at the close of 1951 was estimated at 5,485,000 barrels, or .01 percent of the world total.

During the year, Communist China suffered severely from U. S. and British embargoes on oil exports. Vehicular traffic was heavily reduced, and buses, trucks and many passenger cars were converted to use charcoal fuel.

Known crude reserves in China before overthrow of the Kuomintang were estimated at about 1.5 billion barrels. This figure included only deposits in Shensi, Kansu and Sinkiang in the northwest. Oilfields are situated north and south of Tienshan range in Sinkiang. The north zone extends from Tihwa to Tacheng. The south zone is situated between Kuche and Kashgar. During the year, discoveries of oil were claimed by the Communists in the Takla Makan desert in southern Sinkiang. Shensi oil reserve is composed of three areas: Yenchang, Yungping and Yenan.

Continued exploitation of the northwest oil reserve resulted from the close economic ties between China and Russia. A portion of the 600 technicians trained for the oil industry in 1950 were sent in 1951 to the northwest to assist in exploitation and exploration programs. Industrial equipment was being imported from Russia, and some of the requirements were scheduled to be met by Polish and Czechoslovakia industry.

China's oil shale plants, demolished by fleeing Kuomintang troops, were reported back in operation in 1950 and 1951. The United Nations Economic Commission for Asia and the Far East has estimated China's oil shale reserves at more than 3 billion barrels.

WORLD OIL learned in November, 1951, that Red China's April, 1950, agreement with Soviet Russia providing for joint venture operations in China's oil fields is "joint" in name only. Almost all Red China crude production is being shipped to Russia. The oil is moved through a 1400-mile pipe line running from Yumen in Northwest Kansu through the Gobi desert to Russia's Alma Ata on the Trans-Siberian railway.

The 1950 pact apparently formalized an earlier concession by Red China. That is evidenced by the fact that construction on the pipe line began in February, 1950, two months before the agreement was signed.

One-hundred-twenty Russian engineers, technicians and workers have reportedly assumed control of the Yumen oil fields in 1951. This contingent of oil specialists was drawn from the Baku fields. With the aid of American machinery and technicians, 26 oil wells had been drilled in the Yumen fields by the end of World War II, and were producing 20,225 barrels a month.

Current belief in China is that Russia has deliberately refrained from expanding the refining facilities in China to offer an excuse to send the crude to Russia, ostensibly for refining.

Russian exploitation of Chinese oil caused additional dissatisfaction during the year among Chinese workers, who on several occasions have resorted to sabotage in an effort to stop the flow northward of their scant oil supplies. Frequency of these attempts indicated Communist propaganda of Sino-Soviet friendship failed. Chinese resent seeing their oil go north for refining and never return.

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INDIA

INDIA crude production rose 33,000 barrels in 1951 from an estimated 1,867,000 barrels in 1950 to about 1,900,000. This increase in yearly output amounted to an increase in daily average production of 90 barrels—from 5115 barrels in 1950 to 5205 barrels in 1951.

While India production has remained at a level of slightly more than 1.8 million barrels per year for several years, the rate reached 1,977,695 toward the close of the year.

In addition to extension drilling at Digboi, exploratory drilling was undertaken by Burmah Oil Company (India Concession), Ltd., elsewhere in Assam. The wildcat spudded in at Barsilla during 1950 was abandoned in 1951. However, drilling continued at Nichuguard, near Dimapur, in the Naga Hills southwest of Digboi. Standard Vacuum Oil Company was reported to be carrying out a magnetometer survey in the Himalaya Mountain region.

The Iranian situation lent impetus to India's efforts to set up an oil refining industry. The government of India and Standard Vacuum concluded an agreement on November 30 for installation of a refinery near Bombay which will be completed in about four years. The plant will process annually almost 7.5 million barrels of imported crude.

INDONESIA AND BRITISH BORNEO

Combined Output of Far East's Principal Producing Areas Reaches Record High of 94,578,089 Barrels During 1951

COMBINED crude oil output of Indonesia, British Borneo and Netherlands New Guinea—the principal producing regions of the Far East—reached a new high of 94,578,089 barrels in 1951, up 15,456,766 barrels from the previous year. Four subsidiaries of the Royal Dutch-Shell group accounted for 70,025,028 barrels, with the remaining 24,553,061 barrels produced by N. V. Standard-Vacuum Petroleum Maatschappij.

Indonesia, with the petroleum industry operating at not much greater than one-half potential capacity, had total crude production of 55,353,551 barrels in 1951, up 8,075,064 barrels over the preceding year. The total for the year, while more than 27 times the 1946 low of 2,100,000 barrels, was 6,600,000, barrels under the prewar peak of 62 million barrels reached in 1939. The largest percentage gain in the Far East region for 1951 was in the British Borneo associated territories of Brunei and Sarawak with total output at a record 37,468,938 barrels, an increase of 7,372,102 barrels more than in 1950. Production in Netherlands Western New Guinea for the year amounted to 1,755,600 barrels, up 9600 barrels from 1950.

The petroleum industry in Indonesia, which dates back to 1885 and through 1951 had produced a total of 1¼ billion barrels, at the close of the year faced an uncertain future. Continued internal political complications associated with the birth of the Republic of Indonesia in the postwar period has prevented full rehabilitation of proven oil fields and increasing financial demands of the nation over the industry threaten possible operational retrenchment.

At the close of 1951, 23 of the nation's 60 proven oil fields were still inaccessible due to political circumstances. These inaccessible fields are located mostly in Java, Ceram and North Sumatra. Also one refinery, N. V. de Bataafsche Petroleum Maatschappij's Pangkalan Brandan plant in North Sumatra, has been inoperable since the war because of political disturbances.

As rehabilitation of the war-damaged Indonesian petroleum installations reached full swing in 1951, new difficulties arose at the end of the year that threatened the existence of the industry. These problems centered around the financial agreements between the three concessionaires and the Indonesian government, permitting the operating companies to reinvest large portion of earnings to rebuild field facilities, pipe lines and refineries.

Originally negotiated under Dutch rule and honored by the Indonesian government, the first of these agreements between the nation and N. V. Standard-Vacuum Petroleum Maatschappij expired at the end of 1951. Negotiations between the company and the government on a new agreement began prior to the end of the year, and continued off and on through mid-1952 without a solution. Negotiations were further complicated by a political crisis early in 1952 in Indonesia resulting in the formation of a new left-of-center government in April. The government maintains rehabilitation of damaged facilities has been completed and that no further deductions in taxable earnings should be permitted for this purpose.

Without such permissable deductions, Indonesian income tax and exports taxes of 23 percent on petroleum would result in the government's share of petroleum income ranging from 65 percent to 75 percent. Similar agreements with N. V. Calter-Pacific Petroleum Maatschappij and BPM expire at the end of 1952 and 1955, respectively.

Indonesia's daily crude oil output at the end of 1951 averaged 161,943 barrels, of which BPM accounted for 89,830 barrels a day and Standard-Vacuum's share totaled 72,113 barrels daily. A substantial increase over the 1951 rates will be noticed during the latter part of 1952 as a result of the start of postwar output by Caltex-Pacific from its Minas field of Central Sumatra with 33 wells. A 17-mile, 12-inch pipe line outlet from this field to an upriver terminal on the Siak River was put on flow in mid-May, initially at a rate of 15,000 barrels daily, but later expected to be increased to near 40,000 barrels a day as more tankers to handle export shipments are available. Indonesia's first crude oil exports to the U. S. reached the Richmond, Calif., refinery of Standard Oil Company of California (which with The Texas Company jointly owns Caltex) early in June.

Drilling activity in Indonesia last year was at near postwar peak level with completion of 131 wells, of which 111 were oil producers, one was a gas well and 19 were dry holes. Total footage drilled amounted to 493,-

Southern Seismic Surveys

PRODUCE RESULTS THROUGH EXPERIENCE

EXPERIENCE MAP OF SOUTHERN'S SUPERVISORY STAFF

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ROCKY MOUNTAIN DIVISION
504 Denver Theater Building — Denver, Colorado
ELMER F. BLAKE, Manager

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600 Bailey Avenue Fort Worth, Texas

SIDON HARRIS
President

R. H. DANA
Executive Vice-President

W. D. BAIRD
Vice-President

495. This was a substantial increase over the 88 completions in 1950, of which 70 were oil wells and 18 were dry, though slightly under the 135 completions in 1949.

Exploratory drilling in 1951 accounted for 16 of the total wells drilled, compared with only 10 wildcats in 1950. The exploratory completions in 1951 resulted in five oil producers, a gas well and ten dry holes. Of the five producers, three new fields were definitely estab-

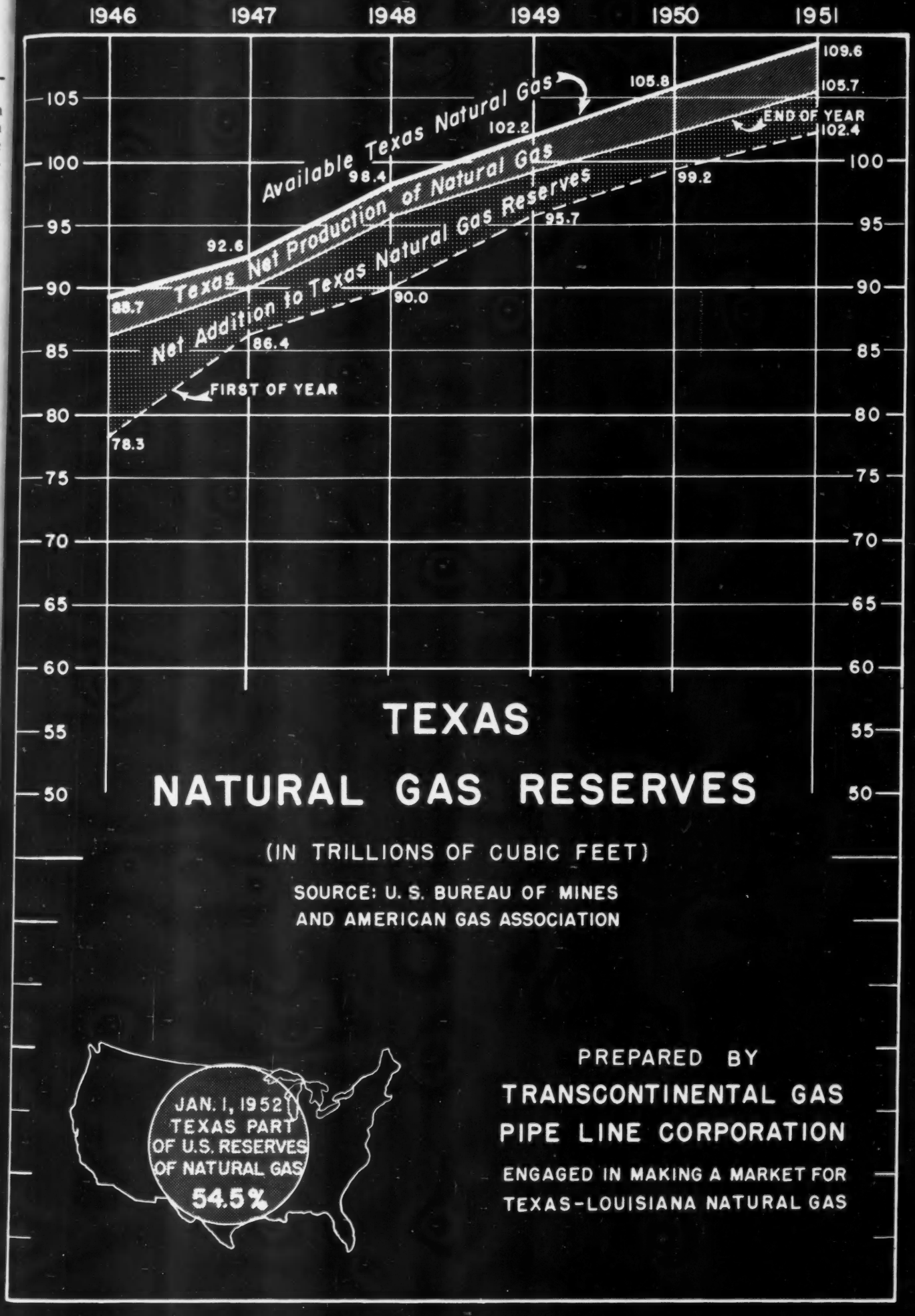
Indonesia, British Borneo and Netherlands New Guinea Oil Production and Geological Data

COUNTRY and FIELD	Year of Discovery	PRODUCING WELLS END OF YEAR			CRUDE OIL PRODUCTION (Barrels)				Gravity of Oil (API)	Formation, Name and Kind	Geologic Age	Producing Depths (Feet)	Type of Structure
		Flowing	Art. Lift	Total	Daily End of 1951	Year 1950	Year 1951	Cumulative					
KALIMANTAN (Indonesia):													
Anggana-Muara[1]	1902	3	89	92	2,580	1,353,400	1,064,900	64,308,500	19–33	B. Papan, P. Balang Series Sand	Miocene	380–3200	Anticline
Balikpapan[1]	1903	....	....	1*	....	1,130	2,050	232,350	14.5	B. Papan Series Sand	Miocene	740–765	Anticline
Bunju[1]	1930	....	....	16*	700	....	83,100	452,100	24–40	Sadjau Series Sand	Pliocene	1970–3100	Anticline
Sambodja[1]	1910	1	49	50	1,220	449,100	458,100	54,425,600	14.5–34	P. Balang, B. Papan Series Sand	Miocene	160–4400	Anticline
Sanga Sanga[1]	1897	2	97	99	3,950	1,226,200	1,303,300	147,163,100	18–36	P. Balang, B. Papan Series Sand	Miocene	430–2900	Anticline
Sangatta[1]	1940	....	....	....	....	260	440	1,150	19–33	P. Balang Series Sand	Miocene	1640–4200	Anticline
Tandjung[1]	1938	....	....	....	A	A	A	611,800	40	Sand-Grit	Eocene	2500–4300	Anticline
Tarakan[1]	1906	3	479	482	6,980	2,691,000	2,555,400	166,575,900	20	Sadjau Series Sand	Pliocene	195–2400	Anticline
JAVA (Indonesia):													
Kawengan[1]	1926	7	38	45	11,100	2,775,000	4,191,400	46,115,000	34.5	Nagrajong Sandy Limestone	Miocene	1750–2700	Anticline
Kruka[1]	1929	....	56	56	1,090	489,700	389,900	8,281,800	30.5	Globegerinae Limestone	Miocene	970–1600	Anticline
Ledok[1]	1896	....	....	....	....	B	B	21,125,000	43	Wonotjclo Ngrajong Sand	Miocene	320–3200	Anticline
Lidah Kulon[1]	1896	....	....	....	....	B	B	33,369,000	24.5	Globergerinae Limestone	Miocene	490–1330	Anticline
Lusi[3]	1932	....	....	....	....	B	B	....	40	Ledok Sand	Miocene	1325–1400	Anticline
Ngliron[3]	1940	....	....	....	....	B	B	....	40	Orbitoid Sand	Miocene	3500–3600	Anticline
Nglobo-Semanggi Banj.[1]	1897	....	....	....	....	B	B	18,044,000	43	Wonotojojo Ngrajong Sand	Miocene	370–3350	Anticline
Petak[3]	1914	....	....	....	....	B	B	781,000	40	Orbitoid Sand	Miocene	2350–2700	Anticline
Trembul[3]	1917	....	....	....	....	B	B	355,000	40	Orbitoid Sand	Miocene	2350–2700	Anticline
CERAM (Indonesia):													
Bula Lemunff[1]	1897	....	....	....	....	B	B	8,203,000	23	Bula Sand	Plio-Tria.	240–920	Anticline
SUMATRA, NORTH (Indonesia):													
Dj-Rajeu[1]	1929	....	....	....	....	B	B	559,000	54.5	Seurula Sand	Pliocene	2520–2590	Anticline
Gebang[1]	1936	....	....	....	....	B	B	135,000	54	Keutapang Sand	Miocene	2970–3480	Anticline
Pangkalan-Susee[1]	1917	....	....	....	....	B	B	6,287,000	56	Keutapang Sand	Miocene	1550–2100	Anticline
P. Tabuhan[1]	1937	....	....	....	....	B	B	3,283,000	52	Keytapang Sand	Miocene	3300–3500	Anticline
Pase[3]	1939	....	....	....	....	B	B	52,000	23–30	Keutapang Sand	Miocene	1600–2200	Anticline
Perlak[1]	1900	....	....	....	....	B	B	47,870,000	57	Keutapang Sand	Miocene	160–2200	Anticline
Pulu Pandjang[1]	1928	....	....	....	....	B	B	11,243,000	55	Keutapang Sand	Miocene	1640–2400	Anticline
Rantau[1]	1929	....	....	....	....	B	B	55,513,000	48	Keutapang Sand	Miocene	1040–2560	Anticline
Serang Djaja[1]	1926	....	....	....	....	B	B	7,551,000	64	Keutapang Sand	Miocene	3600–4150	Anticline
Telaga-Said, Darat, K. Gad.	1893	....	....	....	....	B	B	23,621,000	51	Grensklei Sand	Miocene	210–720	Anticline
SUMATRA, CENTRAL (Indonesia):													
Duri[6]	1941	....	....	....	....	A	A	....	22	Lower Telisa Sands	Miocene	475	Anticline
Lirik-Ukui[3]	1941	1	....	1	A 44	24,016	A 10,521	75,000	34	Lakat Sand	Miocene	1450–1700	Anticline
Minas[6]	1944	....	....	33*	....	C	C	....	35.5	Lower Telisa Sands	Miocene	±2240	Anticline
Pungut[6]	1951	....	....	2	....	A	A	....	....	n.a.	n.a.	n.a.	n.a.
Sebanga[6]	1940	....	....	....	....	A	A	....	30	Lower Telisa Sands	Miocene	±1200	Anticline
SUMATRA, SOUTH (Indonesia):													
Abab[3]	1951	3	....	3	636	....	59,423	59,423	....	n.a.	n.a.	n.a.	n.a.
Babat[1]	1901	1	18	19	70	28,500	27,400	8,193,900	38	Lower Palembang Sand	Miocene	160–1200	Anticline
Badjubang[1]	1927	11	6	17	2,670	1,526,700	1,155,100	28,132,400	46.5	Lower Palembang Sand	Miocene	2700–3300	Anticline
Benakat[3]	1933	47	74	121	8,955	3,335,043	3,368,751	49,656,000	38	Talang Akar. Sand	Miocene	1550–1650	Anticline
Betun[3]	1950	5	....	5	1,574	335,394	773,412	1,109,000	36	Talang Akar. Sand	Miocene	6100–6900	Anticline
Betung[1]	1923	....	....	....	....	B	B	2,100,000	40.5	Lower Palembang Sand	Miocene	180–950	Anticline
Deras[3]	1951	2	....	2	23	....	7,054	7,054	....	n.a.	n.a.	n.a.	n.a.
Djirak[3]	1930	5	114	119	6,516	2,312,513	2,452,981	29,997,000	38	Talang Akar. Sand	Miocene	600–2800	Anticline
Gunung Kemala[1]	1938	48	1	49	3,800	336,100	493,900	1,211,400	34.5	Lower Telisa Sand	Miocene	6070–6250	Anticline
Karan[3]	1950	....	....	....	....	8,005	....	8,005	29	Talang Akar. Sand	Miocene	5850–5950	Anticline
Karang Ringing[1]	1903	....	....	....	....	B	B	1,572,000	42.5	Lower Palembang Sand	Miocene	160–1200	Anticline
Kenali Asam[1]	1931	45	1	46	14,930	3,055,400	5,008,300	29,631,200	22–46	Lower Palembang, Upper Telisa Sand	Miocene	1700–4100	Anticline
Kluang[1]	1914	....	....	....	B	B	B	27,882,000	40	Lower Telisa Sand	Miocene	2300–2600	Anticline
Kruh[3]	1948	5	7	12	531	394,996	258,418	1,153,000	....	n.a.	n.a.	n.a.	n.a.
Limau[1]	1928	8	....	8	3,800	867,900	1,446,600	8,747,700	25.5	Lower Telisa Sand	Miocene	5200–5450	Anticline
Mangundjaja[1]	1935	1	61	62	2,840	852,300	960,900	11,937,850	24.5	Middle Palembang Sand	Pliocene	660–2200	Anticline
Meruo Senami[1]	1938	....	....	....	....	B	B	95,700	48	Upper Telisa Sand	Miocene	2400–2650	Anticline
Muara Enim Complex[1]	1903	....	9	9	90	46,100	33,100	28,251,200	46	Middle Palembang Sand	Pliocene	300–1150	Anticline
North Lembak[1]	1941	....	....	1*	....	....	....	2,110	40	Lower Telisa Sand	Miocene	5250	n.a.
Radja[3]	1941	12	....	12	3,199	889,700	1,284,189	3,252,000	40	Talang Akar. Sand	Miocene	6200–7200	Anticline
Selo[3]	1938	....	....	....	....	....	....	47,000	38	Talang Akar. Sand	Miocene	1600–1900	Anticline
Suban Djerigi[1]	1905	....	25	25	570	210,100	220,500	24,440,500	46	Middle and Lower Palembang Sands	Mio.-Plio	1300–2500	Anticline
Talang Akar.-Pendopo[3]	1922	268	53	321	50,835	13,976,130	16,338,312	176,286,000	38	Talang Akar. Sand	Miocene	2100–2750	Anticline
Talang Djimar[1]	1937	48	1	49	21,100	6,350,700	7,312,300	54,323,900	28.5	Lower Telisa Sand	Miocene	3600–4100	Anticline
Tandjung Luntar[1]	1912	....	....	....	....	B	B	4,072,000	56	Middle Palembang Sand	Pliocene	2200–2800	Anticline
Tandjung Tiga[1]	1940	17	....	17	7,000	1,617,800	1,844,100	4,954,160	25	Lower Telisa Sand	Miocene	4400–4600	Anticline
Tempino[1]	1931	27	4	31	5,340	2,125,300	2,249,700	42,871,900	49	Lower Palembang Sand	Miocene	1930–2700	Anticline
Total Indonesia	....	570	1,182	1,754	161,943	47,278,487	55,353,551	1,266,227,702	....	....	....	....	....
NETHERLANDS NEW GUINEA:													
Klamono[4]	1936	1	16	17	4,820	1,746,000	1,755,600	5,390,900	19	Klasafet Limestone	Miocene	300	Anticline
Mogoi[4]	1940	....	....	2*	....	....	....	459	46	Klasafet Limestone	Miocene	1250	Anticline
Wasian[4]	1940	....	....	2*	....	....	....	862	48	Klasafet Limestone	Miocene	2900–3225	Anticline
Total Netherland New Guinea	....	1	16	17	4,820	1,746,000	1,755,600	5,392,221	....	....	....	....	....
BRUNEI (British):													
Seria[2]	1929	95	91	186	101,323	29,700,000	37,113,023	174,648,078	19–33	n.a. Sand	Tertiary	1600–6900	Anticline
SARAWAK (British):													
Miri[5]	1911	....	115	115	924	396,836	355,915	72,034,650	21–35	n.a. Sand	Tertiary	300–3050	Anticline
Total British Borneo	....	95	206	301	102,274	30,096,836	37,468,938	246,682,728	....	....	....	....	....

* Closed in wells. † Name of location of discovery.

A—Field closed in, no pipe line outlet. B—Fields inaccessible due to political activity. C—Minas field went on production in May, 1952, after completion of pipe line outlet.

[1] N. V. de Bataafsche Petroleum Maatschappij (Shell). [2] British Malayan Petroleum Company, Ltd. (Shell). [3] N. V. Standard-Vacuum Petroleum Maatschappij. [4] Nederlandsche Nieuw Guinea Petroleum Maatschappij (Shell). [5] Sarawak Oilfields, Ltd. (Shell). [6] N. V. Caltex Petroleum Maatschappij.


1946
1947
1948
1949
1950
1951
105
100
95
90
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80
75
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65
60
55
50
109.6
105.7
105.8
102.2
98.4
92.6
88.7
Available Texas Natural Gas
Texas Net Production of Natural Gas
END OF YEAR
102.4
99.2
95.7
90.0
86.4
Net Addition to Texas Natural Gas Reserves
FIRST OF YEAR
78.3
TEXAS
NATURAL GAS RESERVES
(IN TRILLIONS OF CUBIC FEET)
SOURCE: U. S. BUREAU OF MINES
AND AMERICAN GAS ASSOCIATION
JAN. 1, 1952
TEXAS PART
OF U.S. RESERVES
OF NATURAL GAS
54.5%
PREPARED BY
TRANSCONTINENTAL GAS
PIPE LINE CORPORATION
ENGAGED IN MAKING A MARKET FOR
TEXAS-LOUISIANA NATURAL GAS

lished. Two discoveries were made by Standard-Vacuum in South Sumatra, the Abab and Deras fields. By the end of the year, Stan-Vac had completed three wells at Abab with a total daily flow of 636 barrels.

REFINERIES OF INDONESIA AND BRITISH BORNEO

N. V. de Bataafsche Petroleum Mij.: 27,000-barrel-a-day distilling-wax refinery at Balikpapan, Kalimantan, Indonesia.
3600-barrel-per-day distilling refinery at Tjepoe, Java, Indonesia.
2000 barrels daily distilling-asphalt refinery at Wonokromo, Java, Indonesia.
83,000 barrels per day distilling-cracking-reforming refinery at Pladjoe, Sumatra, Indonesia.

N. V. Standard-Vacuum Petroleum Mij.: 64,000-barrel-a-day skim-crack refinery at Palembang, Sumatra, Indonesia.

Sarawak Oilfields, Ltd.: 38,500 barrels daily distilling refinery at Lutong, Sarawak, British Borneo.

PIPE LINES OF INDONESIA, BRITISH BORNEO AND NETHERLANDS NEW GUINEA

Caltex Pacific Petroleum Mij. (Caltex): 50,000-barrel-a-day (60,000-barrel maximum) 17-mile, 12-inch crude line from Minas field to Perawang Terminal in Central Sumatra.

N. V. Nederlandsch-Indische Aardoli Mij. (Shell): 20,000 barrels daily (27,500-barrel maximum) twin crude lines from Tempino field to Pladju in South Sumatra, consisting of one 165-mile, 8-inch line and one 125-mile, 8-inch and 40-mile 6-inch line (in series).

N. V. de Bataafsche Petroleum Mij. (Shell): A Prabumulih field-to-Pladju gathering system in Southern Sumatra, consisting of two 8-inch, 58.5-mile 34,000 barrels daily crude lines; a 58.5-mile, 6-8-inch (in series) products line; a 58.5-mile 4-6-inch (in series) products line; and a 26,500-barrel-a-day, 58.5-mile, 10-inch crude line, which is under construction.
11,000-barrel daily (12,500 barrels maximum), 90-mile, 8-inch crude line from Tjepu field to Surabaja, Java.
Pipe lines from Rantau to Pangkalan Brandan, North Sumatra, which lies in insurgent country and has not been surveyed or operated by owners since pre-World War II. Lines are now believed to be overrun by jungle and largely useless.
150-mile, 10-inch crude line from Tandjung to Balikpapan in Dutch Borneo.
60-mile, 10-inch crude line from Sambodja to Balikpapan, Dutch Borneo.
3 mile, 12-inch system from Tarakan Island to submarine loading lines.
11,500 barrels daily gathering system from Louise field to Balikpapan refinery consisting of 34 miles of 8-inch, 34 miles of 2-5 inch and 34 miles of 6-inch lines.

British Malayan Petroleum Co., Ltd. (Royal Dutch Shell): Crude gathering lines from Serei field to Lutong refinery in British Borneo.
Products lines from Lutong refinery to Serei field.

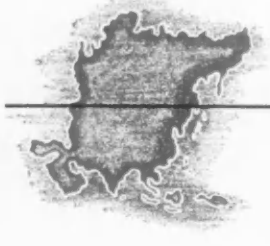
Sarawak Oilfields, Ltd. (Royal Dutch Shell): 5-mile system from Lutong to Miri, site of city docks.
2-3 mile gathering system from Miri docks to submarine loading lines.

Sarawak Oilfields, Ltd. (Shell): 100,000-barrel-a-day (138,000 barrels maximum) gathering system from Seria field to Lutong refinery in British Borneo consisting of 33 miles of 12-inch, 31.3 miles of 8-inch and 7 miles of 8-inch loop.

Standard-Vacuum Petroleum Mij. (Standard-Vacuum): 75,000-barrel-per-day triple line from Talang Akar fields to Palembang, South Sumatra, consisting of two 81-mile, 8-inch crude lines and one 81-mile, 6-inch crude line.
20,000 barrels daily, 58.7-mile, 6-inch crude line from Lirik field to Sungei Salak, Central Sumatra.

Drilling in Indonesia, British Borneo and Netherlands New Guinea

AREA and FIELD	WELLS COMPLETED IN 1950				WELLS COMPLETED IN 1951					Wells Drilling at End of Year
	Oil	Dry	TOTAL Wells	TOTAL Footage	Oil	Gas	Dry	TOTAL Wells	TOTAL Footage	
KALIMANTAN (Indonesia):										
Bunju	5		5	23,268	6			6	36,340	2
Sanga Sanga	2	1	3	8,131	6			6	15,786	1
Sangatta	1		1	8,913						1
Balik Papan	1		1	780						
Tandjung	2	1	3	15,131	2			2	12,344	1
Tarakan	3	1	4	8,373			1	1	4,859	
Wildcats				6,633			1	1	1,324	1
JAVA (Indonesia):										
Gunung Anjar	1		1	5,335						
Kawengan	1		1	5,994	5		2	7	19,034	1
Kruka							1	1	1,818	
Wildcats			1	3,261			1	1	6,565	
SUMATRA (Central):										
Minas	9		9	23,072	18			18	46,354	
Lirik-Ukui	2		2	3,700	4			4	7,600	
Wildcats					2		1	3		
SUMATRA (North):										
Wildcats		1	1	5,118			1	1	1,640	
SUMATRA (South):										
Benakat	2		2	3,200						
Betun	4	1	5	35,000	1		3	4	27,600	
Djirak	8	3	11	8,000	1			1	1,000	
T. Akar-Pendopo	9		9	27,000	37			37	103,600	
Radja	3		3	21,200	2			2	13,400	
Abab					1			1	5,500	
Limau	2		2	15,159	4		2	6	38,846	2
Talang Djimar	4		4	17,552	3			3	14,800	
Gunung Kemala	1	1	2	18,719	2			2	14,728	1
Tandjung Tiga	7	3	10	40,690	6			6	36,374	1
Kenali Asam	1		1	5,423	8			8	28,983	1
Wildcats	2	6	8	36,348	3	1	6	10	55,000	
Total Indonesia	70	18	88	346,030	111	1	19	131	493,495	12
NETHERLANDS NEW GUINEA:										
Klaga		1	1	151						
Klamono	10		10	6,683	4			4	1,526	
Mogoi					2		1	3	6,420	1
Wildcats		6	6	9,305			3	3	8,944	3
Total Netherlands N.G.	10	7	17	16,139	6		4	10	16,890	4
BRUNEI (Brit.):										
Seria	12	1	13	88,894	29		2	31	185,099	4
Total British Borneo	12	1	13	88,894	29		2	31	185,099	4



JAPAN

Crude Output Gains 12.6 Percent Over Previous Year But Still Fills Only 10 Percent of Country's Needs

JAPAN's crude production in 1951 was up 12.6 percent over the 1950 mark, but still amounted to little more than 10 percent of the oil needed to fill Japanese requirements.

Despite declining production from almost all fields, 258,901 more barrels of oil were produced in 1951 than in 1950. Average daily production was 6319 barrels, compared with 5610 in 1950.

One prefecture, Akita, accounted for the gain. Yabase field, which was discovered in 1934 and is operated by Imperial Oil Company, was by far Japan's greatest oil producing area in 1951. An accelerated drilling program in Yabase field resulted in 36 additional oil wells out of the 38 completed, and added 308,000 barrels of oil to Japan's crude supply in 1951. Total footage drilled in that field, including one gas and one water injection well, was almost double the 91,508 feet of hole logged in 1950, when 22 wells were completed. Also in Akita, six producing oil wells were drilled in the Hachimori field.

In other areas, the Yamagata prefecture fields yielded 37,539 fewer barrels of oil in 1951 than in 1950, while the small fields in Hokkaido declined by 1574 barrels. The ancient fields of Niigata, some of which have been producing oil since 1837, continued as the second greatest producers in Japan, but they, too, fell off 6362 barrels from the 383,643 barrels produced in 1950.

Also due to activity in the Akita region, especially Yabase field, drilling figures were up sharply in 1951, both in footage and in number of wells drilled. There were 235 wells completed—72 percent successfully—in all prefectures. While 1951 footage figures for gas wells were not available, oil wells and dry holes, averaging about 4700 feet deep, obtained a total footage of 400,834 feet. That was almost 100,000 feet more than were drilled in the 162 wells of 1950.

Although 26 wildcats were drilled, only two, or 7.7

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By publishing information on new ideas and techniques, WORLD OIL has won world-wide approval of oil producing men.

Unlike other oil publications, which devote most of their pages to reviewing the news, WORLD OIL puts its major effort on the new ideas and developments taking place in the industry. Its success in doing this is proved by the nickname oil men have given it. They call it "the *idea* magazine."

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Will this article help to improve the operations of an oil company, individual operator or contractor?

Will this article help a company, individual operator or contractor to arrive at a decision or formulate a policy?

Will this article help a substantial group of subscribers improve their personal position and chances of promotion?

Will this article carry enough general interest to cause a large number of subscribers (at least half) to want to read it purely from an interest standpoint?

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percent, proved productive. Both producers were in the Niigata prefecture. Even though more rank wildcats were drilled in 1951 than in 1950, the rate of success for such exploratory activity was down considerably. In 1950, 19 wildcats had been drilled, resulting in three oil producers and one gas well.

Gas well drilling was especially active in 1951, with 100 gas wells completed during the year, compared with 67 the year before. Greatest interest was centered in the Yamagata, Niigata and Chiba gas fields, where 85 of the total number were drilled.

An important development in the Japanese petroleum industry took place in April, 1951, when controls were put in the hands of the Japanese government. SCAP (Supreme Commander for the Allied Powers), which had exercised rigid controls over supply and distribution of crude and refined petroleum during the postwar period, relinquished these powers to the Mining Bureau of Japan's Economic Stabilization Board. The only exception to this arrangement was that SCAP retained control of the use of Japanese commercial exchange.

To the Japanese, lifting of occupation controls meant that Japan could expand its refining capacity at will.

Japan's 11 Pacific Coast refineries, which began to go back on stream in 1950 after a four-year shutdown, were greatly improved in 1951, and accounted for the greater part of products available in that country.

Drilling in Japan

PREFECTURE and FIELD	WELLS COMPLETED IN 1950					WELLS COMPLETED IN 1951				
				TOTAL					TOTAL	
	Oil	Gas	Dry	Wells	Footage	Oil	Gas	Dry	Wells	Footage
AKITA:										
Hachimori	5	....	5	10	16,846	6	....	8	14	22,869
Hamada	....	....	....	....	....	1	....	1	2	3,568
Hibiki	1	....	2	3	750	....	....	....	....	....
Iwano	....	....	....	....	....	....	....	1	1	1,979
Katsurazka	1	....	....	1	3,059	....	....	1	1	1,214
Kotaki	1	....	....	1	2,626	4	....	2	6	11,705
Michikawa	1	....	....	1	677	1	....	....	1	599
Sawame	....	....	....	....	....	1	....	....	1	1,557
Tanaka	....	....	....	....	....	....	....	5	5	21,998
Tsuchizaki	....	....	....	....	....	....	....	1	1	5,054
*Yabase	19	....	3	22	91,508	36	....	4	40	182,906
Wildcats	....	....	4	4	13,469	....	....	5	5	10,309
AOMORI:										
Gas Field	....	....	....	....	....	....	1	....	1	n.a.
CHIBA:										
Mobara	....	30	....	30	34,574	....	27	1	28	n.a.
HOKKAIDO:										
Wildcats	....	....	....	....	....	....	....	3	3	15,169
ISHIKAWA:										
Gas Field	....	1	....	1	654	....	1	....	1	n.a.
KAMAGAWA:										
Gas Field	....	....	....	....	....	....	1	....	1	n.a.
IWATE:										
Gas Field	....	3	....	3	574	....	4	....	4	n.a.
NIIGATA:										
Betsuyama	....	....	....	....	....	3	....	....	3	15,584
Echigo-Kurokawa	12	....	1	13	8,588	5	....	....	5	3,675
Iwafune	....	3	....	3	2,361	....	†	....	†	n.a.
Kaji	....	....	6	6	14,492	1	....	2	3	7,977
Miyagawa	1	....	....	1	3,280	....	....	....	....	....
Niigata	....	27	2	29	39,206	....	†	....	†	n.a.
Niitsu	....	....	2	2	2,372	5	....	4	9	9,099
Nishiyama	3	1	2	6	27,460	....	....	....	....	....
Shibata	....	....	1	1	2,140	....	....	1	1	2,892
Gas Fields	....	....	....	....	....	....	34	3	37	n.a.
Wildcats	3	....	7	10	20,730	2	....	11	13	40,638
OSAKA:										
Osaka	....	1	....	1	344	....	....	....	....	....
SHIZUOKA:										
Sagara	1	....	....	1	n.a.	....	....	....	....	....
Gas Fields	....	....	....	....	....	....	4	....	4	n.a.
TOKYO:										
Gas Fields	....	....	....	....	....	....	2	....	2	n.a.
TOYAMA:										
Takaoka	....	1	....	1	2,364	....	2	....	2	n.a.
YAMAGATA:										
Innai	....	....	....	....	....	2	....	5	7	23,160
Narahashi	6	....	2	8	8,483	2	....	2	4	4,242
Nishi-Narahashi	....	....	....	....	....	....	....	1	1	1,313
Gas Fields	....	....	....	....	....	....	24	....	24	n.a.
Wildcats	....	....	4	4	4,591	....	....	5	5	13,336
Total	54	67	41	162	301,118	69	100	66	235	400,834

* Includes one gas injection well and one water injection well.
† See Niigata: Gas Fields.
n.a.—Not available.

Oil Production in Japan

PREFECTURE and FIELD	Year of Discovery	Producing Wells End of 1951	CRUDE OIL PRODUCTION (Barrels) Daily End of 1951	Year 1951	Year 1950	Cumulative Through 1950
AKITA:						
Asahikawa[1]	1908	105	59	20,839	21,912	4,240,520
Asani[1]	1940	17	3	1,000	1,311	10,627
Hachimori[1, 3, 4, 5, 6]	1938	86	188	78,689	60,524	694,480
Hamada[1]	1951	....	....	83	....	83
Hanekawa	1919	25	9	3,633	3,749	223,216
Hibiki[7]	n.a.	10	9	2,721	3,604	91,171
Innai[1]	1922	166	370	133,273	139,634	4,563,646
Iwako[3]	1939	....	....	....	....	9,950
Kamihama[1]	1940	13	52	20,298	26,128	138,343
Kamioguni[1]	n.a.	92	79	31,916	34,859	1,207,721
Katsurane[1]	1919	68	21	7,186	8,031	728,930
Katsurazaka[1]	1928	23	68	25,576	26,797	390,938
Katte[1]	1919	67	20	7,957	8,414	623,821
Kotaki[1]	1938	42	39	16,015	13,403	223,117
Kurokawa[1]	1912	96	81	28,023	28,286	7,418,421
Matsugasaki[1]	1941	....	....	....	....	335
Michikawa[1, 2]	1922	103	84	28,441	29,319	n.a.
Niida[1]	1938	5	9	2,504	2,961	132,847
Tanaka[1]	n.a.	....	....	....	....	557
Toyoiwa[1]	1902	4	6	2,294	2,674	35,348
Toyokawa[1, 3]	1912	134	89	27,732	30,025	5,165,420
Urayama[1]	1912	61	33	10,877	10,261	n.a.
Uchimichikawa[1]	1921	....	....	....	....	31,881
Yabase[1]	1934	418	3,088	1,359,557	1,051,553	12,512,229
Total Akita	....	1,535	4,307	1,808,614	1,503,725	38,443,601
HOKKAIDO:						
Atsuta[1]	n.a.	8	3	978	1,025	23,971
Fururoi[1]	1905	58	17	6,404	7,429	332,204
Ishikari[1]	1903	87	31	10,982	11,372	899,573
Karumai[1]	1906	38	8	3,128	3,234	393,463
Kinausu[8]	1936	....	....	.....	.....	126
Kitatoyotomi[1]	n.a.	1	....	.....	.....	143
Koetoi[1]	1922	7	4	1,267	1,325	33,061
Masuporo[1]	1923	2	1	3[*]	302	40,515
Menashi[1]	1915	6	1	5.4	416	14,251
Toyotomi[1]	1930	....	....	.....	.....	5,670
Wakkanai[1]	1914	....	....	.....	.....	5,785
Yuchi[8]	1939	3	....	97	204	6,842
Total Hokkaido	....	210	65	23,733	25,307	1,755,604
NAGANO:						
Asakawa	n.a.	3	....	85	105	n.a.
NIIGATA:						
Amaze[1]	1837	....	....	137	141	3,123
Betsuyama[1]	n.a.	35	77	36,818	....	403,456
Echigo-Kurokawa[1, 3, 10]	1941	150	149	24,281	21,664	213,832
Gozu	1902	18	5	2,427	3,114	53,141
Higashiyama[1]	1874	254	198	71,320	71,996	7,123,178
Ishiji[1]	1934	....	....	....	....	166,000
Izumozaki[10]	n.a.	16	....	438	301	25,928
Kaji[3]	1945	18	12	6,479	8,186	45,413
Kajikawa[1]	n.a.	1	11	4,639	8,483	22,104
Kashiwazaki[1]	1936	1	1	272	274	9,696
Kengamine[1]	1941	1	1	237	314	1,256
Kuwazone[1]	1945	....	....	....	....	176
Maki[1, 10]	1900	148	12	4,483	4,789	927,198
Miyagawa[1]	1895	29	7	2,568	2,630	1,944,549
Niitsu[1, 3, 10]	1874	662	459	154,594	153,147	18,362,549
Nishiyama[1]	1898	183	113	41,572	79,341	12,687,148
Ohmo[1]	1916	41	24	8,535	10,299	1,369,793
Shibata[1]	1945	5	17	6,278	7,152	81,054
Takamachi[1]	1924	72	26	9,769	9,635	3,257,068
Teradomari[1]	1898	....	....	....	....	2,685
Torigoe[1]	n.a.	43	6	2,434	2,177	89,584
Tsukioka[3]	1941	....	....	....	....	296
Total Niigata	....	1,677	1,118	377,281	383,643	46,789,227
SHIZUOKA:						
Sagara[11, 12]	1908	17	1	212	238	29,177
YAMAGATA:						
Chokaisan[1]	1922	27	28	8,902	10,782	391,498
Ishinazaka[1]	1944	18	105	43,165	51,375	478,579
Narahashi[1]	1947	20	100	44,552	71,904	172,001
Nishi-Narahashi[1]	n.a.	....	....	.....	97	808
Yadergawa[1]	n.a.	....	....	.....	.....	63
Total Yamagata	....	65	233	96,619	134,158	1,042,949
Other Small Fields	....	....	....	.....	467	n.a.
Total Japan	....	3,507	5,724	2,306,544	2,047,643	88,060,558

[1] Imperial Oil Company.
[2] Karita Industrial Company.
[3] Daido Oil Company.
[4] Nippon Mining Company.
[5] Fuji Mining Company.
[6] Eguchi Mining Company.
[7] Nichibei Oil Industrial Company.
[8] Hokkaido Oil Development Company.
[9] Shinetsu Oil Company.
[10] Niigata Oil Production Association.
[11] Saito Oil Company.
[12] Others.
* Data from Imperial Oil Company only.
n.a.—Not available.

PAKISTAN

Extensive Exploration Carried Out in East and West; 273,355 Barrels of Oil Produced by One Flowing Well

PAKISTAN Petroleum Ltd., an associated company of Burmah Oil Co., carried out extensive oil exploration and prospecting activities in East and West Pakistan during 1951.

The company began drilling a series of core holes northeast of Sylhet town by the end of November. The holes were scheduled to be drilled to a depth of 4000 feet, and each hole will be electrically surveyed to measure properties of the rock penetrated.

Pakistan Petroleum, Ltd., produced 273,355 barrels of oil in 1951 from its single flowing well at Balkassar field in West Pakistan. This yearly yield for the year was built on a daily average of 758 barrels. The company completed one oil well at Galkassar field at a total depth of 8610 feet.

A test well in the Patharia Hills, spudded in during March had reached 5000 feet and was approaching its final objective. High pressures made drilling difficult, and a 115-pound per cubic foot drilling mud had to be used to continue drilling. Ten and ¾-inch casing was set at 2355 feet and 7-inch at 3813 feet. Numerous signs of gas were encountered. Poor oil shows were met. However, tests of the oil shows were expected to give definite evidence of the value of the sands.

Encouraging oil shows were found during July in Pakistan Petroleum's test well 4 at Chakwal (Punjab) at 8212 feet.

During October, the company spudded in its first test well at Sui, Dera Bugti (Baluchistan). The test well was being drilled by the most modern type of diesel engined rig which is capable of drilling to 10,000 feet.

The first magnetic survey by air, ever conducted in Asia was undertaken by Standard-Vacuum Oil Company.

Drilling Operations in Pakistan

COUNTRY and FIELD	Operating Company	WELLS COMPLETED IN 1950			Wells Drilling End of 1951	WELLS COMPLETED IN 1951		
		Dry	TOTAL Wells	TOTAL Footage		Oil	TOTAL Wells	TOTAL Footage
WEST PAKISTAN:								
Balkassar	Pakistan Petroleum, Ltd.	1	1	8,939	1	1	1	8,610
Lakhra	Pakistan Petroleum, Ltd.	....	1	12,666	....	....	....	.....
Sui, Baluchistan	Pakistan Petroleum, Ltd.	....	....	.....	1	....	....	.....
EAST PAKISTAN:								
Patharia	Pakistan Petroleum, Ltd.	....	....	.....	1	....	....	.....
Sylhet	Pakistan Petroleum, Ltd.	....	....	.....	1 (Core-hole)	....	....	.....

Pakistan Oil Production and Geological Data

COUNTRY and FIELD	PRODUCING WELLS: Year of Discovery	PRODUCING WELLS: End of 1951 Flowing	PRODUCING WELLS: End of 1951 Art. Lift	PRODUCING WELLS: Total	CRUDE OIL PRODUCTION (Barrels): Daily Average for 1951	CRUDE OIL PRODUCTION (Barrels): Year 1951	CRUDE OIL PRODUCTION (Barrels): Year 1950	CRUDE OIL PRODUCTION (Barrels): Cumulative Through 1951	Proved Area (Acres)	Gravity of Oil (API)	Formation Name and Kind	Geologic Age	DEPTH (Feet): Min. to Top of Pay	DEPTH (Feet): Max. to Bottom of Pay	Structure
WEST PAKISTAN:															
Balkassar	1949	1	....	1	758	273,355	422,429*	n.a.	n.a.	0.926	Sakesar, Limetsone	Lower Eocene	8114	n.a.	Dome
Lakhra	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sui, Baluchistan	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
EAST PAKISTAN:															
Patharia	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sylhet	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Exclusive of Attock Oil Co., Ltd., production.

PHILIPPINES

Government Bureau of Mines Undertakes Exploration Activity, Drilling at Standstill During Dull Year

PETROLEUM activity in the Philippines hit a lull in 1951. Exploration was undertaken primarily by the Philippine Bureau of Mines, whose geological surveys covered La Union and a portion of Mountain Province in Luzon Island, the southern part of Mindoro Island where gas seeps and salt springs have existed, and a part of the Cotabato Basin.

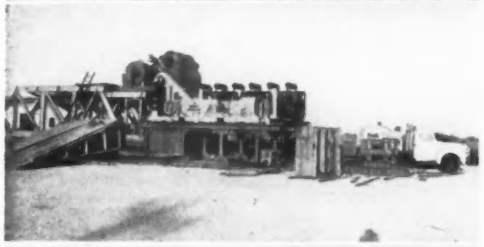
The mapping of these areas is in line with the government's objective of enhancing the possibilities of private capital exploiting likely petroleum areas. The government has long realized that indigenous oil production and consequent development of a Philippine oil industry will contribute to the improvement of the national economy.

The initial exploration concession under the 1949 oil law was issued to the Philippine Oil Development Company, Inc., a local private corporation, embracing 246,842 acres situated in Central Luzon, near Manila. The Maglihi Mining Association was also granted three patents for its holdings in Bondoc Peninsula in Southern Luzon with an area of 474 acres.

No drilling activity was undertaken for the year, but PHODCO intends to resume in 1952 the drilling of its leasehold in Bondoc Peninsula. No field discovery has yet been made in the Philippines.

Caltex (Philippines), Inc., submitted to the Philippine government a proposal for the construction of a refinery in Batangas Province, Luzon, to use imported crude.

Partial View of S&R Shops and Rig in Process of Assembly for Export.



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AUSTRALIA

Interest in Petroleum Possibilities Revived as New Company Starts Geological Surveys in Desert Country

A REVIVED interest in the petroleum possibilities of Australia occurred in 1951 with the beginning of geological surveys by Western Australasian Petroleum Proprietary, Ltd., a new company formed by California Texas Oil Company and Ampol, an Australian organization, over 350,000 square miles of desert country in Western Australia.

Drilling of the initial exploratory test in the Northwest Basin was scheduled to begin in 1952 at a location about 800 miles north of Fremantle, the port city of Western Australia, and 200 miles north of Carnarvon. Drilling equipment capable of drilling to a depth of at least 15,000 feet was being assembled in the United States. This equipment was expected to leave for Australia during the summer of 1952, and actual drilling was scheduled to commence the latter part of the year.

Prospecting permits extend generally along the northern coast from the eastern boundary of the State of Western Australia to its southwest tip. Five large river basins are included in the region, although the section is an arid desert tableland of large stone outcroppings.

In the Northwest Basin, the Bureau of Mineral Resources, Geology and Geophysics, had a party of four geologists in the field for six months during 1951. Systematic surface mapping and stratigraphic studies were continued, and a total thickness of 11,000 feet of Permian sediments is now established. The lower part of the Permian succession is marine with a strong admixture of glacial material, and the upper portion is mainly marine.

Temporary land-locked conditions of the basin are indicated by black shales with a small proportion of evaporites. About 9000 feet of Devonian and Carboniferous marine sediments resting on the pre-Cambrian basement underlies the Permian along the eastern margin of the basin.

In coastal areas, Paleozoic rocks are overlapped by several hundred feet of marine Cretaceous and Tertiary sediments.

A gravity meter reconnaissance survey was carried out by the geophysical section of the bureau, covering the northern part of the basin, north of the Gascoyne River.

In the Desert Basin (Kimberley division), the bureau had another party of four geologists in the field for six months. They mapped the zone of Devonian sediments, mostly reef limestones, along the northeastern margin of the basin.

Four major anticlinal structures enclosed by Permian sediments were mapped: Poole Range, St. George Range, Grant Range and Mount Wynne structures.

A seismic survey will be carried out in 1952 on Nerrima Dome, and a new test location may be selected. The new deep test, which has to be carried down to a depth of 10,000 feet, will explore the Devonian reef limestones. The well will be a joint venture between the Commonwealth of Australia, the State of Western Australia and the Freney-Kimer Kimberley Company.

In the Roma area (Queensland), a gravity meter and seismic reflection survey was carried out in 1951. A deep test was scheduled.

In the Rolleston district (Queensland), 150 miles north of Roma, a seismic reflection survey was carried out to the north of Rolleston. Shallow basement was indicated, and Shell decided not to test this structure and to surrender its Queensland permits.

In the Tertiary basin of the Lake Entrance area of Southern Victoria, a gravity meter survey was carried out simultaneously with an airborne magnetometer survey.

The Western Australasian-Ampol exploratory test was the first major effort to find oil in Australia since a Royal Dutch-Shell Group subsidiary, Shell (Queensland) Development Company, abandoned in 1950 its Morella structure well at about 4600 feet. The search for oil in Australia has been carried out intermittently for more than a half century, with but a single discovery. And that was a field with small production of heavy crude from the shallow Lake Entrance area, 200 miles east of Melbourne in Victoria. Numerous geophysical and geological surveys have been conducted by Standard-Vacuum Oil Company, Anglo-Iranian Oil Company, the Commonwealth and various state governments.

Australian refining capacity will be increased sevenfold over the next few years from the present 17,500 barrels daily in four small plants to about 130,000 barrels a day.

NEW ZEALAND

Efforts to Find Oil Renewed During 1951 Despite Widespread Exploration Failures in Past Years

RENEWED efforts to find oil sprang up in 1951 in New Zealand despite widespread disappointments which have met exploration efforts.

The New Zealand government sponsored a 1951 survey directed toward the study of prospects for new drilling. Government officials said the survey, which was completed during the year, would be the basis on which a decision whether to undertake further oil exploration would be made. Government interest in the project stems from its value as a defense measure. However, no announcement of a decision was made.

British and American oil companies discontinued activities in New Zealand in 1944, after 13 deep tests based on geological and geophysical prospects failed.

The Moturoa field of North Island has intermittently produced small quantities of petroleum for the past three-quarters of a century. Postwar production has averaged about 1890 barrels a year. New Zealand's immediate prospects for oil production are slight.